BHARTI UNIVERSITY DURG (C.G.)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of P1 Group (Civil & Mech.)

B Tech (First Semester - Common to all Branches of Engineering) 2021 -22

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks
							Theory/Lab			
				L	T	P	ESE	CT	TA	
1.	Basic Sciences	Physics-I	BT00101	3	1	-	70	10	20	100
2.	Basic Sciences	Mathematics-I*	BT00102	3	1	-	70	10	20	100
3.	Electrical Engineering	Basic Electrical and Electronics Engg.	BT00103	2	1	-	70	10	20	100
4.	Mechanical Engineering	Engineering Graphics and Design	BT00104	1	0	-	70	10	20	100
5.	Computer Science	Fundamentals of Computer	BT00105	2	0	-	70	10	20	100
6.	Basic Sciences	Physics (Lab)	BT00106	-	-	2	35		15	50
7.	Electrical Engineering	Basic Electrical and Electronics Engg. (Lab)	BT00107	-	-	2	35		15	50
8.	Computer Science	Fundamentals of Computer (Lab)	BT00108	-	-	2	35		15	50
9.	Mechanical Engineering	Engineering Graphics and Design (Lab)	BT00109	-	-	4	35		15	50
10.	Humanities	Value Education	BT00110	-	-	-			50	50
			Total Marks	11	3	10	490	50	210	750

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note:

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1- GROUP: Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1- GROUP: Computer Science, Information Technology, Electronics & Instrumentation, Electrical, Chemical, Electrical & Electronics, Plastic Engineering,
Agriculture Engineering, Biotechnology

(b) *Mathematics-I will be taught to both the groups in the first semester.

(c) Value Education will be conducted by the relevant discipline/humanities as decided by the Principal.

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Semester: B.Tech- Ist **Branch: Common to all Branches**

Subject: Physics-I **Course Code: BT00101**

Total Marks in End Semester Exam: 70 **L: 3 T: 1 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

Course Objective:

Basic concepts of Mechanics, Optics and its applications, Electromagnetism, Quantum & Semiconductor Physics.

Note:

5 Units / Semester - Total 50 hrs. (L + T)

Branch wise:

- Civil/Metallurgy/Mining- Units 1/2/3/8/10
- Mechanical/ Mechatronics/ Production/Automobile - Units 1/4/5/6/10
- Electrical/Electrical & Electronics/Chemical- Units 1/3/7/8/9
- Computer Science/IT/Electronics/EI/AEI/Biotech - Units 1/7/8/9/10

Unit-1: Physical Quantities, Motion in Two or Three dimensions (10hrs.)

Standards and Units, Unit consistency and conversions, Uncertainty and Significant figures, Estimates and orders of magnitude, Position and velocity vectors, The Acceleration vector, Projectile motion, Motion in a circle, Relative velocity, Free body diagrams, Conservative and Non-conservative Forces; Central forces, No inertial frames of reference.

Unit-2: Mechanics of Solids (10hrs.)

Angular velocity and acceleration, Rotation with constant angular acceleration, Relating linear and angular kinematics, Energy in rotational motion, Parallel axis theorem, Moment of Inertia calculations, Conditions for equilibrium, Bending Stress, Shear stress, Concept of strain energy, Elastic Module, Concepts of elasticity and plasticity.

Unit-3: Wave Optics (10hrs.)

Superposition of waves and interference of light by wave front splitting and amplitude splitting, Fresnel bi- prism; wedge shaped film, Newton's rings, Farunhofer diffraction from a single slit, The Rayleigh criterion for limit of resolution and its application to vision, Diffraction gratings and their resolving power.

Unit-4: Electrostatics in vacuum and dielectric medium (10 hrs.)

Calculation of electric field and electrostatic potential for a charge distribution, Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Laws of electrostatics, Polarization, Permeability and dielectric constant, Polar and non-polar dielectrics, Solving simple electrostatics problem in presence of dielectrics like Point charge at the centre of a dielectric sphere.

Unit-5: Magneto static in a linear magnetic medium (10 hrs.)

Bio- Savart law, Divergence and curl of static magnetic field,vector potential and calculating it for a given magnetic field using Stokes' theorem, Magnetization, Solving for magnetic field due to simple magnets like a bar magnet, Permeability and Susceptibility, Classification of magnetic materials, Ferromagnetism, Paramagnetic and diamagnetic materials, Magnetic domains and hysteresis.

Unit-6: Faraday's law and Electromagnetic waves (10hrs.)

Faraday's law of electromagnetic induction, Continuity equation for current densities, displace current and magnetic field arising from time dependent electric field, Maxwell's equation in vacuum, Energy in an electromagnetic field, Flow of energy and Pointing vector, Plane electromagnetic waves in vacuum, Their transverse nature and polarization, Relation between electric and magnetic fields of an electromagnetic wave.

Unit-7: Introduction to Quantum Mechanics (10 hrs.)

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, Expectation values (only basic), Free-particle wave function and wave-packets, Uncertainty principle, Solution of stationary-state Schrodinger equation for one dimensional problem like particle in a box.

Unit-8: Solid electronic materials (10 hrs.)

Electron in periodic potential, Kronig-Penny model (only basic to introduce origin of band gap), E-k diagram conduction, Conductivity, D, Electron rift velocity, Energy bands in solids, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Occupation probability, Fermi level, Effective mass, Density of states and energy band diagrams.

Unit -9: Semiconductors (10hrs.)

Intrinsic and extrinsic semiconductors, Electron and hole concentration, Concept of Fermi Level, Dependence of Fermi level on carrier-concentration and temperature, Doping, impurity states, n and p

type semiconductors, Carrier generation and recombination, Law of mass action, Charge neutrality condition, Carrier transport: diffusion and drift, p-n junction, Depletion region and potential barrier, Energy band structure of PN junction in forward and reverse biasing ,Metal semiconductor junction (Ohmic and Schottky).

Unit-10: Lasers & Fiber Optics (10hrs.)

Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion in optical resonator, different types of lasers: gas lasers (He-Ne,), solid-state lasers (ruby, Neodymium), semiconductor laser, Properties of laser beams.

Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total internal reflection, Numerical aperture and various fiber parameters, Losses associated with optical fibers, Step and graded index fibers, Application of optical fibers.

Course Outcomes:

Students will be familiar with:

- Mechanics of solids, Wave optics & its engineering applications.
- Some of the basic laws related to electromagnetic.
- Introduced to the principle of Semiconductor physics.

Simple quantum mechanics calculations.

Text Books:

1. Introduction to Mechanics- Mahendra K. Verma, Universities Press, Hyderabad
2. David Griffiths, Introduction to Electrodynamics, Addison-Wesley Professional
3. H. J. Pain, The Physics of Oscillations and Waves, Wiley
4. J. Singh, Semiconductor Optoelectronics: Physics and Technology McGraw-Hill Inc
5. Quantum Mechanics, Ajay Ghatak S. Lokanathan, Trinity
6. Engineering Physics by Gaur & Gupta, Dhanpat Rai Publications

Reference Books:

1. Engineering Physics by PG Kshirsagar& M N Avadhanulu, S. Chand Publications
2. Modern Physics for Engineers, S.P. Taneja, R. Chand
3. Engineering Physics, Malik and Singh, Tata McGraw Hill
4. Sears and Zemansky's University Physics, Volume-1 Mechanics, Pearson
5. Mechanics, Mathur, S.Chand Publishing

6. Electromagnetic Theory, Prabir K. Basu & Hrishikesh Dhasmana, Ane Books
7. David Griffiths, Quantum Mechanics, Pearson Education
8. Quantum Mechanics: A Text Book for undergraduates, Mahesh C Jain, TMH
9. A. Ghatak , Optics, McGraw Hill Education
10. O. Svelto, Principles of Lasers, Springer Science & Business Media
11. The Physics of waves and Oscillations, N.K. Bajaj, TMH
12. H. C. Verma, Concepts of Physics Vol – 1&2, Bharti Bhawan Publication
13. Halliday and Resnick, Physics.

Semester: B.Tech - Ist **Branch: Common to all Branches**

Subject: Mathematics - I **Code: BT00102**

Total Marks in End Semester Exam: 70 **L: 3 T: 1 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis 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. More precisely, the objectives are:

- To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.
- To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To develop the tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To familiarize the student with functions of several variables that is essential in most branches of engineering.
- To develop the essential tool of matrices and linear algebra in a comprehensive manner.

UNIT I: Calculus **(8 hours)**

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

UNIT II: Calculus **(8 hours)**

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: Sequences and series: **(8 hours)**

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV :Multivariable Calculus (Differentiation) **(8 hours)** Limit, continuity and partial derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence directional derivatives.

UNIT V: Matrices **(8 hours)**

Rank of a matrix by elementary transformation, normal form of a matrix, System of linear equations; Symmetric, skew symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem and Orthogonal transformation.

Text/Reference Books

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. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora,
9. An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005

Course Outcomes:

1. 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.
2. The students will learn:
3. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
4. The essential tools of matrices and linear algebra including linear transformations, eigen values, diagonalization and orthogonalization.

Semester: B.Tech- Ist **Branch: Common to All Branches**

Subject: Basic Electrical and Electronics Engineering **Code: BT00103**

Total Marks in End Semester Exam: 70 **L: 2 T: 1 P: 0**

Minimum number of class tests to be conducted: 02 **Minimum Marks: 25**

Course Objective:

- Understand the basic concepts of DC and AC circuits.
- Analyse the series, parallel and series, parallel ac circuits.
- Acquire knowledge about working principle, construction and losses of a transformer.
- Understand the working, characteristics and applications of diodes.
- Understand the construction, working, characteristics and applications of a transistor.

Unit – I: D.C. Networks:

Introduction, Ohm's law, Kirchhoff's laws, Mesh and Nodal analysis, Superposition theorem, (only independent sources)**.** Definitions of MMF, Magnetic field strength, Reluctance, Leakage flux and fringing, Core losses, Comparison of the Electric and Magnetic Circuits, Problems on Series Magnetic Circuits.

Unit – II: A.C. Circuits:

Production of AC voltage, Basic Definitions of root mean square and average values, form factor and peak factor, the j operator and Phasor Algebra, Analysis of ac series and Parallel Circuits, Series-Parallel Circuits.

Unit – III: Single phase Transformers:

Introduction, Principles of operation, Constructional details, Ideal Transformer and Practical Transformer, EMF equation, Rating, Phasor diagram at no load, Losses in Transformers.

Unit-IV: Diode:

Brief Review of Semiconductors, N-Type & P-Type Semiconductors, Formation of Depletion Layer in a PN Junction, Forward & Reverse Biased, V-I Characteristic, Diode Current Equation,Diode Applications.LED, Advantages & applications of LEDs., Seven-segment Displays,

Unit-V: Transistor:

BJT Construction, Junction Biasing of BJT, Operation of NPN & PNP BJT, Input and Output Characteristics of Transistor in CE configuration; Transistor as an Amplifier& as a Switch. Advantages of ICs & Scale of Integration.

Course Outcomes:

- Apply the knowledge of basic laws to electric and magnetic circuits.
- Distinguish between various types of representation of ac quantities.
- Draw the phasor diagrams of an ideal and a practical transformer at no load.
- Analyse and design basic circuits which include diode, LED and seven segment display.
- Analyse and design circuits consisting of transistors.

Text Books:

1. Fundamentals of Electrical Engineering & Electronics, B.L. Theraja,S. Chand Publication.
2. Principles of Electronics by V. K. Mehta, 3rd Edition, S. Chand and Co.Ltd.**(Unit-IV & V)**
3. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI.

Reference Books:

1. Fitzrald and Higgonbothom, "Basic Electrical Engineering", Fifth Edition, McGraw Hill.
2. V.N. Mittal and Arvind Mittal, "Basic Electrical Engineering", Second Edition, Tata McGraw Hill.
3. Electrical and Electronic Technology by Hughes 10th Edition, Pearson Education.
4. A textbook of Electronic Circuits. By R. S. Sedha, S. Chand Publication.
5. H. Cotton,"Advance Electrical Technology," ISSAC Pitman, London.
6. Parker Smith S. (Ed. Parker Smith N.N.), "Problems in Electrical Engineering", Tenth edition, Asia publication.
7. Del Torro, Vincent "Electrical Engineering Fundamentals", Second Edition Prentice Hall of India Pvt. Ltd.
8. Basic Electrical & Electronics Engineering 1stEdition by **D. P. Kothari** and **I. J. Nagrath,**
9. Electronics Devices and Circuits by Jacob Millman and Christos C. Halkias, 3rd Edition Mc. Grah Hill Pub.

Semester: B.Tech - Ist **Branch: Common to All Branches**

Subject: Engineering Graphics and Design **Code: BT00104**

Total Marks in End Semester Exam: 70 **L: 1 T: 0 P: 0**

Minimum number of class tests to be conducted: 02 **Minimum Marks: 25**

Course Objective:

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises of geometrical solids.
2. Understanding of technical drawings
3. Learn basic CAD software skills.
4. Learn basic engineering drawing formats.
5. Make basic engineering drawings using graphics software.
6. Develop the graphical skills for communication of concepts, ideas and design of engineering

Unit I: Introduction to Engineering Drawing

Principles of Engineering drawing and their significance, Lines, Lettering, Dimensioning, Scales,

Unit II: Projection

Principles of projection, Method of projection, First and third angle projections, Orthographic projections, Isometric projection.

Unit III: Basic concept of drafting software

Introduction to CAD software, merits and demerits of CAD, Application of CAD, GUI, limits and units, Basic co-ordinate system, setting of status bar option-snap, grid, O-snap, Dynamic input, ortho, polar, and etc. concept of block, viewports and layer.

Unit IV: Drafting using CAD software

Drawing Tools: Circle, Arcs, Rectangle, Polygon, Ellipse, Spline, Poly-Line, and Multi-Line. Editing Tools: Trim, Move, Copy, Rotate. Geometry Modifying Tools: Fillet, Chamfer, Scale, Stretch. Copying Tools: Array, Mirror, and Offset. Dimensioning and Annotations.

Unit V: 3-D modeling using CAD software

Types of three dimensional model, basic primitives' tools: extrude, revolve, sweep, loft, wedge. Solid editing Tools: shell, round, taper faces, copy faces, chamfer edges, modifying tools: 3D- move, 3D-

copy, rotate, scale, align. Copying tools: array and its type,

Text Books:

1. Bhatt, N.D., "Elementary Engineering Drawing", Charotar Book Stall, Anand
2. George Omura, " Mastering AutoCAD" B.P.B. Publication, New Delhi

Reference Books:

1. Engineering Graphics – Laxminarayanan & V. and Vaish Wanar, R.S. Jain Brothers, New Delhi
2. Engineering Graphics – Chandra, AM & Chandra Satish 1998.
3. Engineering Graphics – K.L. Narayan and P. Kannaih, Tata McGraw Hill
4. AutoCAD: A problem solving approach- Tickoo, S. Delmar Cengage Learning 2015.
5. Mastering AutoCAD and AutoCAD LT-George Omura, Brian C. Benton, Wiley publisher, 2018.

Course Outcomes:

After learning the course the students should be able to

- To know and understand the conventions and the method of engineering drawing.
- To improve their visualization skills through interpretation of Orthographic, Isometric views of objects so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings.
- To create 2-D Computer geometry and it’s dimensioning.
- To create 3-D Computer geometry and able to visualize it for presentation graphics.

Semester: B.Tech - Ist **Branch: Common to All Branches**

Subject: Fundamentals of Computer **Code: BT00105**

Total Marks in End Semester Exam: 70 **L: 2 T: 0 P: 0**

Minimum number of Class tests: 02 **Minimum Marks: 25**

Course Objective:

1. To learn the Computer Fundamental concepts
2. To aware students about Software and Hardware
3. To make them to use basic components of MS Office
4. To give the foundations for different Applications

Unit I: Fundamentals of Computers

Generations of computer, block diagram of a computer, computer hardware and software components: Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Memory Hierarchy: Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks vs optical disks (CD, CD-RW and DVD Memory), data – numeric data, alpha numeric data, concept of data and information: storage, seeking, processing and transmission.

Unit II: Hardware and Software

Computer Peripherals: Cables, Buses, Device drivers, installation of devices: keyboard, mouse, scanner, printer, web-camera, speakers and many more; plug-and-play devices; expansion slots……..System software, Program Language Translators, application software, Programming Language Paradigms: Imperative, Object-Oriented and Logic languages, Basics of Popular Operating Systems (Windows and Linux); The User Interface, Using Mouse and Organizing Desktop components, Running an Application, File, Folders and Directory management features, Using Help; Creating Short cuts, Configuring Operating System: Windows and Ubuntu, BIOS, System Utilities and Antivirus software.

Unit III: Basic Computer Literacy

Word Processing Basics (MS Word / Libre Office Writer): Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document; Using Spread Sheets

(MS Excel / LibreOffice Calc) Basic operations of Spreadsheets; Manipulation of cells; Formulas and

Functions; Editing of Spread Sheet, printing of Spread Sheet; Basics of presentation software (MS PowerPoint / LibreOffice Impress) Preparation and Presentation of Slides; Slide Show; How to make an effective presentation: Working with Presentation Tools (Create, Edit, Move, Delete, Resize, Format text object), Working with Graphics tools (Creating Tables, Organization Charts, Hyperlinks), Saving, editing and closing presentation; Taking printouts of presentation / handouts.

Unit IV: Computers and Communication

WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Networking Devices, Topologies, Cables and connectors, Connecting to internet; ISP; Basics of internet connectivity related troubleshooting, Web Browsing software, Search Engines; URL; Domain Names; IP

Addressing, Wi-Fi and Bluetooth technology overview, Internet and Intranet: architecture, various file formats, Applications of INTERNET: Electronic mailing systems (Google Mail features): Creating and Managing mailing accounts, folders, Document collaboration, Instant Messaging, Netiquettes; Skype calling and Messenger services; functioning and features of smart gadgets: Smart phones, 4K smart television gadgets, kindle, gaming-gadgets, fitness gadgets and alike.

Unit V: Application Domains

Impact of computers in society: Computer applications in office automation, book publishing, data analysis, accounting, investment, inventory control, graphics and multimedia, air and railway ticket reservation sites, robotics, cyber security, Audio and Video-conferencing, social networking, surveillance, Case Studies: Computer Literacy for banking, KYC, Insurance and financial transactions, operating mobile banking, Nine Pillars of Mission Digital India (DI-Initiatives) and their scheme highlights.

Text Books:

1. Computer Basics by IGNOU.
2. Suresh K Basendrea: Computers Today
3. Pradeep K. Sinha, Priti Sinha, “Computer Fundamentals”. BPB Publications.
4. Rajaraman, V., “Fundamental of Computers”. Prentice Hall India, New Delhi
5. Sanders Donald H Computers Today

Course Outcomes:

The student will learn

1. To familiar with Computer Fundamental
2. To know about MS Office.

3. To use different text, spreadsheet and presentation skill.
4. To apply different applications.

Semester: B.Tech - Ist **Branch: Common to all branches**

Subject: Physics (Lab) **Course Code: BT00106**

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 2**

Minimum Marks: 12

Course Objective:

Physics lab provides students the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Total 36 labs. Hrs. About 10 – 12 experiments to illustrate the concepts learnt in Physics (Hrs. 3/ week). Suitable number of experiments from the following categories:

- Mechanics
- Optics and its applications
- Electromagnetic
- Semiconductor Physics
- Laser & Optical fiber

Text book:

1. A textbook of Engineering Physics Practical 2nd edition, University Science Press

Laboratory Objective:

Students should be able to

- State various laws which they have studied through experiments.
- Describe principles of LASER & Optical fibre.

Semester: B.Tech - I^{s} **Branch: Common to All Branches Subject: Basic Electrical and Electronics Engineering (Lab)** **Code: BT00107**

Minimum Marks: 12

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 2**

Lab Objective:

- Verify the basic laws and theorems of DC circuits.
- Analysis the RLC series, parallel and series, parallel ac circuits.
- Understand the construction and perform ratio test on a single phase transformer.
- To plot and find out the characteristics of a diode in forward and reverse bias.
- Top plot and find out the input and output characteristics of a transistor

List of Experiments (To perform minimum 10 experiments):

1. To verify Superposition theorem.
2. To verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
3. To determine V– I characteristics of Incandescent lamp.
4. To study B-H curve.
5. To measure current, power, voltage and power factor of series RLC circuit.
6. To measure current, power, voltage of parallel RLC circuit.
7. To measure current, power, voltage of series parallel RLC circuit.
8. To measure R and L of choke coil.
9. To study construction of a single phase transformer.
10. To perform ratio test and polarity test of a single phase transformer.
11. To calculate efficiency of a single phase transformer by direct loading.
12. To verify Thevenin's theorem and Norton's theorem.
13. To study construction of Single Phase A.C. machines.
14. To study construction of Three Phases Induction motors.
15. To study charging and discharging of a capacitor.
16. To study types of meters in the lab.
17. To study construction of D.C. machine.
18. To plot V-I characteristics of PN Junction Diode.
19. To plot V-I characteristics of Light Emitting Diode.
20. To plot Static Characteristics of Transistor in CE configuration

21. To study the operation of transistor as a switch.
22. To study the operation of transistor as an amplifier.

Lab Outcomes:

Students will be able to

- Relate the Basic laws and theorems with the practical applications.
- Apply the knowledge in their daily life with electrical circuits.
- Visualize the magnetic and electric circuits in a transformer.
- Analyze diode circuits and to design and implement diode applications.
- Analysis and design circuits using bipolar transistors.

Semester: B.Tech - Ist **Branch: Common to All Branches**

Subject: Fundamental of Computer (Lab) **Code: BT00108**

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 2**

Minimum Marks: 12

The laboratory should be preceded or followed by a Practical Lecture to explain the approach or algorithm to be implemented for the problem given. Open Source software can be used.

Practical Lecture (L T P) – 0 0 1	**Lab. Work (L T P) – 0 0 3**
PracticalLecture1:Introduction and working of Hardware Components	**Lab1**: Identifying the computer hardware like input output devices, CPU, mother board, Buses etc.
PracticalLecture2:Introduction and working of Software.	**Lab 2**: Making Algorithm, DFD, ER diagram. Working of software's like system, Utility, Application software.
PracticalLecture3: Introduction and working of Operating System	**Lab 3**: Basic operations of Operating System: creating file, Directory, Removing file, directory, date time setting, renaming etc. use internal and external connabds.
Practical Lecture 4:Introduction and working of MS Office	**Lab 4**: use the basic features of MS Office
PracticalLecture5:Introduction of MS Word	**Lab5: Create** the document with all alignment. Use the different properties of MS Word
Practical Lecture 6: Introduction of MS Excel	**Lab 6**: Make the use of Spreadsheet for data representations, Calculation and graphical presentations. Use properties of Excel
Practical Lecture 7: Introduction of Power presentation	Lab 7: MS-PowerPoint Make the presentation with Multimedia features. Use the animation tools
Practical Lecture 8 &9: Introduction of computer communication	**Lab 8 and 9**: *Computer communication related practical* Connect the Internet; open any website of your choice and save the WebPages. Search any topic related to your syllabi using any search engine and download the relevant material. Send any greeting card to your friend. Create your E-Mail ID on any free E-Mail Server. Login through your E-Mail ID and do the following: Read your mail

	Compose a new Mail Send the Mail to one person Send the same Mail to various persons Forward the Mail Delete the Mail
	end file as attachment Surf Internet using Google to find information about your state Surf Internet using Google to find Tourism information about your state Surf Internet using Yahoo to find Hotels around your state Surf Internet using Google to find information about educational institutes for teaching M.S in comp science in India Internet using Google to find information about Indian Compare the cost, overheads and

Practical Lecture 10: installing Computer System	**Lab 10:** Installing the working computer system
Practical Lecture 11: Different ICT use of Government Schemes	**Lab 11: Filling online AAADHAR, Voter id, PAN etc form**
Practical Lecture 12: Applications of Computer in Digital India	**Lab 12**: online filling of different digital India applications

Laboratory Outcomes:

- To give idea about fundamentals of Computer
- To make familiar with MS Office
- To be able to write, document, present their work when developing project
- To be able to better foundations in Computer Field.
- To be able to know online applications of Digital India.

Text & Reference books:

1. Pradeep K. Sinha, Priti Sinha, “Computer Fundamentals”. BPB Publications.
2. Rajaraman, V., “Fundamental of Computers”. Prentice Hall India, New Delhi
3. Suresh K Basendrea: Computers Today
4. Sanders Donald H Computers Today

Semester: B.Tech - Ist **Branch: Common to All Branches**

Subject: Engineering Graphics and Design (Lab) **Code: BT00109**

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 4**

Minimum Marks: 12

List of Practical:

1. Study of any drafting software- GUI, limits and units, drawing tools, editing tools, annotations, etc.
2. Study of co-ordinates systems- Cartesian and polar (absolute and relative system of measurement) and Practice drawing by using following tools: Grid, snap, O-snap, Lines, Erase, Zoom.
3. Study and create drawing by using Drawing tools: Circle, arcs, rectangle, polygon, ellipse, Editing tools: trim, move, copy, rotate and practice of drawing using these commands.
4. Study and create drawing by using Geometry modifying tools: fillet, chamfer, scale, stretch
5. Study and create drawing by using copying tools like array, mirror, block and offset.
6. Study and detailing of drawing by using dimensioning and annotations tools.
7. Study and create drawing with different types of line by using Layer command
8. Create geometry by modify it by using Scales- plane and diagonal scale and create conics sections- ellipse, parabola, hyperbola, rectangular hyperbola, involutes.
9. Draw regular solids: Cube, Prism, Pyramid, Cylinder, Cones
10. Draw sectional views of solids- Cube, Prism, Pyramid, Cylinder, Cones.

BHARTI UNIVERSITY DURG (C.G.)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination of Q1 Group (CSE AND ELE.)

B Tech (Second Semester - Common to all Branches of Engineering) 2021 -22

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks
							Theory/Lab			
				L	T	P	ESE	CT	TA	
1.	Basic Sciences	Chemistry-I	**BT00201**	3	1	-	70	10	20	100
2.	Basic Sciences	Mathematics-II**	**BT00202**	3	1	-	70	10	20	100
3.	Computer Science	Programming for Problem Solving	**BT00203**	3	-	-	70	10	20	100
4.	Humanities	English	**BT00204**	2	-	-	70	10	20	100
5.	Civil Engineering	Basic Civil Engineering and Mechanics	**BT00205**	3	-	-	70	10	20	100
6.	Basic Sciences	Chemistry (Lab)	**BT00206**	-	-	2	35	-	15	50
7.	Computer Science	Programming for Problem Solving (Lab)	**BT00207**	-	-	4	35	-	15	50
8.	Civil Engineering	Basic Civil Engg. & Mechanics (Lab)	**BT00208**	-	-	2	35	-	15	50
9.	Mechanical Engineering	Workshop Practice/ Manufacturing Process (Lab)	**BT00209**	-	1	4	35	-	15	50
10.	Humanities	Language (Lab)	**BT00210**	-	-	2	-	-	50	50
Total Marks				**14**	**3**	**14**	**490**	**50**	**210**	**750**

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Note :

(a) The teaching in the 1st and 2nd Semester will be divided in two groups consisting of various branches as shown below :

P1-GROUP : Electronics & Telecommunication, Mechanical, Civil, Mining, Applied Electronics & Instrumentation, Metallurgy, Mechatronics, Automobile, Production Engineering, Fashion and Apparel Engineering

Q1-GROUP : Computer Science, Information Technology, Electronics & Instrumentation, Electrical,

Chemical, Electrical & Electronics, Plastic Engineering, Agriculture Engineering, Biotechnology

(b) **Mathematics-II will be taught to both the groups in the second semester.

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Chemistry-I **Code: BT00201**

Total Marks in End Semester Exam: 70 **L: 3 T: 1 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

Unit I – V is common for all braches except Chemical Engineering

Unit VI – X are specific to Chemical Engineering

Unit – I Atomic &molecular structure 10 hours

Molecular orbital Theory: Equations for atomic and molecular orbitals (LCAO), Energy level diagram of homo(H_2,N_2,O_2,Li_2, F_2) & hetero molecules (CO,NO, HF), Concept of bond order. Pi-molecular orbitals of butadiene, benzene and aromaticity.

Crystal Field Theory: Splitting of d- orbital of octahedral and tetrahedral complexes, Energy level diagram of transition metal ion & magnetic property, numerical based on Crystal field stabilization energy.

Unit – II Spectroscopic techniques and applications 10 hours

Principle of spectroscopy. Electromagnetic radiation, Spectrophotometer (line diagram)

Electronic Spectroscopy **(**Ultraviolet–visible spectroscopy): Theory, Types of electronic transition, Chromophore, auxochromes, Electronic excitation in conjugated dienes, Absorption Laws, applications on quantitative analysis, Simple numerical based on absorption laws and uses or application of Electronic Spectroscopy

Vibrational spectroscopy (Infrared spectroscopy): Molecular vibration, Selection rule, functional group region, fingerprint region and uses or application of Vibrational spectroscopy.

Nuclear magnetic resonance spectroscopy: Introduction, number of signal, chemical shift, Spin-spin coupling and uses or application of Nuclear magnetic resonance spectroscopy.

Unit – III Use of free energy in Chemical Equilibria 8 hours

Thermodynamic Functions: Energy, Entropy, Free energy, Cell potential & related numerical, Estimations of entropy and free energies, Nernst Equation & its application to voltaic cell, Relation of free energy with EMF.

Corrosion: Electrochemical theory of corrosion, galvanic series, Galvanic corrosion, Differential aeration

corrosion, Pitting, and Water line corrosion, Caustic embrittlement, factors affecting corrosion , Cathodic Protection.

Unit –IV Periodic properties **8 hours**

Periodic table, atomic and ionic radii, ionization energies, electron affinity, electro negativity. Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms. Polarizability, Oxidation states, coordination numbers and geometries, Hard, soft acids and bases (Classification, Pearsons HSAB principle ,its applications & limitations) Molecular Geometry(Valence shell electron pair repulsion theory to NH_3,H_3O+, SF_4, CIF_3, ICl_2 and H_2O), Numerical based on effective nuclear charge.

Unit –V Organic reactions and synthesis of drug molecule 8 hours

Introduction to reactions involving substitution (free radical-Chlorination of molecule, Gomberg reaction, Wurtz reaction, Electrophilic, Nucliophilic-SN^1 SN^2), Addition (Electrophilic–Morkownihoff rule,Nuclophilic)Elimination (α elimination , β elimination , unimolecular E_1, biomolecular E_2), oxidation (Baeyer villiger oxidation), reduction (Clemmensen reduction, Wolff-Kishner reduction) cyclization (Bergman Cyclization) and ring openings and rearrangement reaction (Beckamann, Reimer- Tiemann reaction, Canannizaro, crossed cannizzaro reaction)

Synthesis of a commonly used drug molecule: General guidelines of drug making, synthesis of Aspirin, Ibuprofen, Paracetamol.

Unit –VI Introduction to quantum theory 8 hours

Schrodinger equation & its importance, Applications to hydrogen atom, Wave mechanical model for many electron atoms-radial distribution curves.

Unit –VII Chemical bonding in molecules: 10 hours

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit –VIII Stereochemistry: 8 hours

Introduction to Stereochemistry: Representations of 3 dimensional structures, Chirality, Optical activity. Isomerism- structural isomerism, stereoisomers, enantiomers, diastereomers, Configurations (D, L &R, S), Geometrical isomerism (cisandtrans & E and Z). Racemic modification & the irresolution, Isomerismin transitional metal compounds.

Conformational analysis: Conformations of cyclic (cyclohexane) and acyclic compounds (ethane & butane).

Unit –IX Reactivity of organic molecules: 8 hours

Organic acids and bases: factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions.

Unit–X Strategies for synthesis of organic compounds: 10 hours

Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents.

Course Outcomes:

The concepts developed in this course will aid in the quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Rationalise periodic properties such as ionisation potential, electro negativity, Oxidation states.
- List major to significant chemical reactions that are used in the synthesis of molecules.
- Use the knowledge of quantum theory in various chemical systems.
- Appreciate aliphatic chemistry and stereochemistry
- Write simple mechanisms

Text Books:

1. A. TextBook of Engg. Chemistry, Shashi Chawala, Dhanpat Rai & Co. (P) Ltd.
2. Engineering Chemistry by P.C. Jain (Dhanpat Rai Publishing Company.
3. Engineering Chemistry, Concept in engineering Chemistry by Satyaprakash and Manisha Agrawal by Khanna Publication.

Books for Chemical Engineering:

1. Advanced Inorganic Chemistry Vol 1& II by Gurdeep Raj,GoelPublishing House.
2. Organic Reaction and Their Mechanism, P. S. Kalsi, New Age International Publishers.

Reference Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N.E. Schore, 5thEdition
7. Essentials of Physical Chemistry, Bahi & Tuli,S.ChandPublishing
8. Introduction to Nano science by S. M. Lindsay

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Mathematics – II **Code: BT00202**

Total Marks in End Semester Exam: 70 **L: 3 T: 1 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

UNIT I

Multivariable Calculus (Integration) **(8 hours)**

Double and triple integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian),

Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes (without proof) & its applications.

UNIT II

First order ordinary differential equations **(8 hours)**

Exact, linear and Bernoulli's equations, Euler's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT III

Ordinary differential equations of higher orders **(8 hours)**

Higher order linear differential equations with constant coefficients & variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Power series solutions; Legendre polynomials and their properties, Bessel functions of the first kind and

their properties.

UNIT IV

Complex Variable – Differentiation (8 hours)

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT V

Complex Variable – Integration (8 hours)

Contour integrals, Cauchy- Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series. Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

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. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems,9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice HallIndia, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Programming for Problem Solving **Code: BT00203**

Total Marks in End Semester Exam: 70 **L: 3 T: 0 P: 0**

Minimum number of Class tests: 02 **Minimum Marks: 25**

Course Objectives:

- To learn the Computer Fundamental concepts
- To aware students about Problem Solving approach
- To make them to use basic components of Programming

Unit I: Introduction (4 lectures)

Introduction to Programming, 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, Pseudo code and Source code with examples.

Unit II: Programming Concepts (9 lectures)

Variables, data types, memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence, Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit III: Arrays (9 lectures)

Introduction to Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

Unit IV: Function (9 lectures)

Definition, prototyping, built in libraries, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion: Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit V: Structure (9 lectures)

Defining structures and Array of Structures, Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), bit-fields.

File handling: concept of a file, text files and binary files, Formatted I/O, file I/O operations, example programs

Course Outcomes:

The student will learn-

- To formulate simple algorithms for arithmetic and logical problems.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

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, Prentice Hall of India

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: English **Code: BT00204**

Total Marks in End Semester Exam: 70 **L: 2 T: 0 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

UNIT – I

Vocabulary Building

Root words from foreign languages and their use in English

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

Synonyms, antonyms, Homonyms and Homophones.

One Word Substitution

Basics of Phonetics: Definitions, Phonetic Symbols, Transcription of one and two syllable words

Communication: Definition, Cycle, Elements, 7Cs & Barriers

UNIT – II

Basic Writing Skills Types of Sentences and Tenses, Voices and narration

Use of phrases and clauses in sentences

Importance of proper punctuation

Creating coherence

Techniques for writing precisely

UNIT – III

Identifying Common Errors in Writing

Parts of speech, Subject-verb agreement

Noun-pronoun agreement

Misplaced modifiers

Articles

Prepositions

Redundancies

Clichés

Errors in Spelling/ Misspelled words

UNIT – IV

Writing Practices Comprehension

Précis Writing

Essay Writing

Business Letters & Job Application

Formal Reports: Components & Characteristics

Writing e-mails

UNIT – V

Listening

Listening: Definition, purposes, types, and strategies to improve listening.

Characteristics of effective listening.

Barriers to Listening and measures to overcome barriers

Note making: types and conversion of notes into texts.

UNIT – VI

Oral Communication (This unit involves interactive practice sessions in Language Lab)

Listening Comprehension

Pronunciation, Intonation, Stress and Rhythm

Common Everyday Situations: Conversations and Dialogues

Communication at Workplace

Interviews

Formal Presentations

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

Suggested Books:

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 Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
7. English and Communication Skills for Students of Science and Engineering. S.P. Dhanavel. Orient

Blackswan Ltd.2009.

8. Scientific English: A Guide for Scientists and Other Professionals. R A Day. Universities Press. 2000.
9. Word Power Made Easy. Norman Lewis. W R Goyal Publishers and Distributors. Publishers. 2009
10. Textbook of English Phonetics for Indian Students. T Balasubramaniam. Macmillan Publishers.2012
11. Technical Communication: Principles and Practice. Meenakshi Raman and Sangeeta Sharma. Oxford University Press. 2015.

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Basic Civil Engineering & Mechanics **Course Code: BT00205**

Total Marks in End Semester Exam: 100 **L: 3 T: 0 P: 0**

Minimum number of Class Tests: 02 **Minimum Marks: 25**

Course Objectives:

- To introduce about the properties of common building materials to the students.
- To introduce the basic concepts of concrete and foundation to the students.
- To introduce the basic concepts of surveying & levelling to the students.
- To introduce the basic concepts of general system of forces to the students.
- To introduce the simple methods of analyzing truss to the students.

UNIT – I

Building Material

Qualities of good brick, Water absorption and Compressive Strength test for bricks. Types of Cement, Ingredients of Portland cement and their functions, Fineness, Setting Times and Compressive Strength of Cement, Functions of Sand in mortar, Mortar Mix proportions for various uses.

UNIT – II

Building Construction

Ingredients of Cement Concrete, Grades of Concrete, proportions for Nominal mix concrete, Workability & Compressive Strength of Concrete, Curing of Concrete.

Necessity of foundations, Definitions of Safe bearing capacity, Ultimate bearing capacity and factor of safety, Difference between Load Bearing & Framed Construction.

UNIT – III

Surveying & Levelling

Principles of Surveying, Technical terms, Calculation of reduced level by Height of instrument and Rise & Fall method, Simple problems in levelling.

UNIT – IV

General System of Forces

Equations of equilibrium for a system of concurrent forces in a plane.Constraint, Action and Reaction.Types of support and support reactions. Free Body Diagram – Body subjected to two forces &

Body subjected to three forces. Moment of a force. Theorem of Varignon, Equations of Equilibrium.

UNIT –V

Analysis of Plane Trusses

Engineering Structures, Rigid or perfect Truss, Determination of Axial forces in the members of truss, Method of Joints, Method of Sections.

Course Outcomes:

After completing the course students should be able to

- Identify the properties of common building materials.
- Understand basic concepts of concrete and foundation.
- Understand the basic concepts of Surveying & levelling.
- Understand the basic concepts of general system of forces.
- Analyze truss by simple methods.

Text books:

1. Comprehensive Basic Civil Engineering B.C. Punmia
2. Building construction by Ahuja and Birdi
3. Engineering Mechanics by A. K. Tayal

Reference books:

1. Basic Civil Engineering by Ramamurutham
2. Engineering Mechanics by R. K. Bansal

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Chemistry-I (Lab) **Course Code: BT00206**

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 2**

Minimum Marks: 12

List of Experiments:

Choice of 8 – 10 experiments from the following:

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/ organic compounds.
10. Saponification/acid value of oil.
11. Chemical analysis of salt / organic compounds.
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 .
18. Spectrophotometric determination.

Course Outcomes:

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 analyse a salt sample

Text Books:

1. Laboratory Manual Engg. Chemistry, Anupama Rajput, Dhanpat Rai & Co. (P) Ltd.
2. Laboratory Manual on Engg. Chemistry, S. K. Bhasin& Sudha Rani, Dhanpat Rai & Co. (P) Ltd.

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Programming for Problem Solving (Lab) **Code: BT00207**

Total Marks in End Semester Exam: 35 **L: 0 T: 0 P: 4**

Minimum Marks: 12

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

Practical Lecture (L T P) – 0 0 1	**Lab. work (L T P) – 0 0 3**
Practical Lecture 1: Problem solving using computers	**Lab1**: Familiarization with programming environment
Practical Lecture 2: Variable types and type conversions	**Lab 2**: Simple computational problems using arithmetic expressions
Practical Lecture 3: Branching and logical expressions	**Lab 3**: Problems involving if-then-else structures:
Practical Lecture 4: Loops, while and for loops	**Lab 4**: Iterative problems e.g., sum of series
Practical Lecture 5: 1D Arrays: searching, sorting	**Lab 5**: 1D Array manipulation
Practical Lecture 6: 2D arrays and Strings	**Lab 6**: Matrix problems, String operation
Practical Lecture 7: Functions, call by value	**Lab 7**: Simple functions
Practical Lecture 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):	**Lab 8 & 9**: Programming for solving Numerical methods problems
Practical Lecture 10: Recursion, structure of recursive calls	**Lab 10**: Recursive functions
Practical Lecture 11: Pointers, structures and dynamic memory allocation	**Lab 11**: Pointers and structures
Practical Lecture 12: File handling	**Lab 12**: File operations

Laboratory Outcomes

- To formulate the algorithms for simple problems

- To translate given algorithms to a working and correct program• To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self referential structures.
- To be able to create, read and write to and from simple text files.

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, Prentice Hall of India

Semester: B.Tech – 2nd | **Branch: Common to all Branches**

Subject: Basic Civil Engineering & Mechanics (Lab) | **Code: BT00208**

Total Marks in End Semester Exam: 35 | **L: 0 T: 0 P: 2**

Minimum Marks: 12

List of Experiments:

1. Water Absorption test on bricks.
2. Compressive strength test on bricks.
3. Fineness of cement by sieve analysis.
4. Initial setting time of cement.
5. Compressive Strength test of Cement.
6. Sieve analysis and F.M. of fine aggregate.
7. Sieve analysis and F.M. of coarse aggregate.
8. Compressive strength test of Concrete.
9. Difference in level between two given stations by Height of Instrument method.
10. Difference in level between two given stations by Rise & Fall method.

Semester: B.Tech – 2nd **Branch: Common to all Branches**

Subject: Workshop Practice/Manufacturing Process (Lab)Code: BT00209

Total Marks in End Semester Exam: 3 **L:0 T:1 P:4**

Minimum Marks: 12

Course Objective:

The course is designed to meet the following objectives.

- Acquire skills in engineering practice.
- To identify tools, work materials and measuring instruments for different trades.

Unit I:

Forging: Introduction to manufacturing process, and its classification, use of various forging tools, forging operations, forging defects.

Suggested Jobs: Forging of chisel, forging of screw driver.

Unit II:

Carpentry: Different types of wood, carpentry tools, different joints, polishing, wood working Lathe.

Suggested Jobs: Making of name plate, stools and a small job on wood working lathe.

Unit III:

Fitting Shop: Introduction to bench working. Work holding devices, measuring instruments, fitting tools and their specification, types of joints fitting operations.

Suggested Jobs : Preparation of job by use of filling, sawing, chipping, drilling and tapping operations.

Unit IV: Moulding: Pattern materials, allowances, moulding terminology.

Suggested Jobs : Prepare moulds of patterns, casting small household objects like paper- weight etc.

Unit V: Welding: Study and use of gas, Arc, soldering, brazing methods. Safety precaution.

Suggested Jobs : Preparing Lap and Butt joints by gas and arc welding method.

Unit VI: Metal Cutting: Common machining operations, different machine tools, cutting tools materials, different type of Lathes, Lathe operations, shaper and its specification. Quick return mechanism of shaper.

Suggested Jobs : Making small shaft, cutting screw thread on Lathe.

Course Outcomes:-

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Text Books:

1. 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.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.
3. B.S. Raghuvanshi, Workshop Technology, Vol I&II, Dhanpat Rai & Sons.

Reference Books:

1. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
2. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
3. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
4. M.L.Begeman and B.H.Amstead, Manufacturing Process, Wiley
5. W.A.J.Chapman and E. Arnold, Workshop Technology, Vol I, II, & III, CRC Press, Prentice Hall
6. V.Narula, Workshop Technology, S.K. Kataria and sons.

BHARTI UNIVERSITY DURG (C.G.)

SCHEME OF TEACHING AND EXAMINATION

Courses of Study and Scheme of Examination

B.Tech (Third Semester-Electrical Engineering) 2021-22

	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks
				L	T	P	Theory/Lab			
							ESE	CT	TA	
1.	Basic Science	Mathematics - III	BT00301	3	1	-	70	10	20	100
2,	Electrical Engg.	Electrical Circuit Analysis	BT03302	3	1	-	70	10	20	100
	Electrical Engg.	Electrical Machines — I	BT03303	3	1	-	70	10	20	100
4.	Electrical Engg.	Digital Electronics	BT03304	2	1		70	10	20	100
5.	Electrical Engg	Numerical Methods	BT03305	2			70	10	20	100
6.	Electrical Engg.	Electrical Machines Laboratory - I	BT03306	-	-	2	35	-	15	50
7.	Electrical Engg.	Electrical Circuit Analysis Laboratory	BT03307	-	-	2	35	-	15	50
8	Electrical Engg	Digital Electronics lab	BT03308	-	-	2	35	-	15	50
9.		Software Laboratory	BT03309				35	-	15	50
10	Electrical Engg.	(Applications of Numerical Methods in Open Source)	BT03310	-	-	2	-	-	50	50
11.	Humanities	Personality Development	BT03311	-	-	2	-	-	50	50
			Total Marks	13	4	10	490	50	260	800

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class **0**Test, TA-Teacher's Assessment

Name of program: Bachelor of Technology **Semester: III**

Branch: All Branches **Code: BT00301**

Subject: Mathematics-III **Total Tutorial Period:01**

Total Theory Period:03 **Class Test: Two(Minimum)**

Assignment: Two(Minimum) **Maximum Marks: 70**

Minimum Marks: 25 **ESE Duration: Three Hours**

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I

Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II

Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non- homogeneous linear equations, Method of separation of variables.

UNIT- III

Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV

Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V

Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes:

After studying the contents of the syllabus in detail the students will be able to: Define (mathematically)

unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Electrical Circuit Analysis **Code: BT03302**

Total Marks in End Semester **Tutorial Periods: 12**

Total Theory Periods: 36 **Total Theory Exam: 70**

Minimum Marks: 25

Course Outcomes:

1. CO1: Evaluate the responses by applying network theorems to electrical circuits.
2. CO2: Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
3. CO3: Obtain and analyze the transient and steady-state response of electrical circuits.
4. CO4: Obtain and analyze the response of electrical circuits using Laplace Transform for standard inputs.
5. CO5: Analyze two port circuit behavior with different parameters.

UNIT I:

Network Theorems (10 Hours)

Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem (all theorems - analysis with dependent current and voltage sources). Super node and Super mesh Analysis, Concept of duality and dual networks. Series and parallel resonance conditions.

UNIT II:

Sinusoidal steady state analysis (11 Hours)

Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits (balanced circuit), Mutual coupled circuits, Dot Convention in coupled circuits,

UNIT III:

Solution of First order networks (7 Hours)

Solution of first order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response

UNIT IV:

Electrical Circuit Analysis Using Laplace Transforms (10 Hours)

Review of Laplace Transform, initial and final value theorem. Analysis of electrical circuits using Laplace Transform for standard inputs (step, ramp and impulse functions), convolution integral, inverse Laplace transform, transformed network with initial conditions..

UNIT V:

Two Port Network and Network Functions (10 Hours)

Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks, Reciprocity & Symmetry, cascade, series, parallel and series-parallel connections of Two port Networks, Barlett's bisection Theorem.

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

Reference Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
2. Alexander & Sadiku, "Fundamentals of Electric Circuits", TMH Publications.
3. C. L. Wadhwa, "Network Analysis and Synthesis", New Age Publications.
4. Kuriakose, "Circuit theory", PHI Learning Publications.

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Electrical Machines – I **Code: BT03303**

Total Theory Periods: 36 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70 **Minimum Marks: 25**

Course Outcomes: After successful completion of this course students will be able to-

1. CO1: Calculate various magnetic circuit variables and app for force/torque generation.
2. CO2: Develop equivalent circuit, phasor diagram of transformer and use them for performance analysis.
3. CO3: Analyze different type of connections of single and three phase transformer.
4. CO4: Appreciate various tests on transformer and DC machines.
5. CO5: Analyze the performance and operation of transformer and DC machines.

UNIT I:

Magnetic Circuits and Electromagnetic Force/Torque (8 hours)

Review of magnetic circuit - MMF, flux, reluctance, inductance, B-H curve of magnetic materials, linear and non-linear magnetic circuits.

Electromechanical energy conversion - Energy stored in magnetic circuit, force as a partial derivative of stored energy with respect to position of a moving element, torque as a partial derivative of stored energy with respect to angular position of a rotating element; Examples-galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

UNIT II:

Single Phase Transformer (10 hours)

Review of single phase transformer - Constructional features, operating principle, EMF equation, ideal transformer, phasor diagram of transformer on no-load and on load, excitation phenomenon.

Performance and Testing-Equivalent circuit, per unit representation, voltage regulation, losses, efficiency, condition for maximum efficiency, all-day efficiency, open circuit and short circuit test, back-to-back test, polarity test, separation of losses, parallel operation (equal and unequal voltage ratios)

Auto-transformer-Equivalent circuit, phasor diagram, comparison with two winding transformer, conversion from auto- transformer to two winding transformer and vice versa.

UNIT III:

Three Phase Transformer (10 hours)

Three-phase transformers-Constructional details (three and five limb), bank of three single phase units, three phase single unit transformer, different connections and vector groups, calculation of efficiency and regulation **Applications** - Power transformer, distribution transformer, parallel operation of three-phase transformer, Scott connection, open delta connection, tap changing transformer.

UNIT IV:

DC Machine-I (10 hours)

Electromagnetic principle of DC machine, BLV and BLI concept, constructional details, production of voltage and torque, classification of DC machine, armature reaction and its effect, methods to reduce armature reaction, commutation, methods of improving commutation, effect of brush shift, Operating characteristics of DC separately excited, series and shunt generator, condition of self excitation, critical speed and critical resistance.

UNIT V:

DC Machine-II (10 hours)

Electrical and mechanical characteristics of DC motor, starters for shunt motors-three point and four point starter, speed control of DC motors- armature and field control method, losses in DC machines, efficiency and condition for maximum efficiency, Testing of DC machines- Swinburne's test and Regenerative test (Study only).

Text Books:

1. Nagrath and Kothari, "Electric Machines", TMH Publications.
2. B. R, Gupta, "Electrical machines", New Age International.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers.

Reference Books:

1. J. B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria & Sons.
2. Ashfaq Hussain, "Electric Machines", Dhanpat Rai Publication.
3. Samarjeet Ghosh, "Electrical Machines", PHI Publications.
4. P. K. Mukherjee and S. Chakravarti "Electric Machines", Dhanpat Rai Publication.

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Digital Electronics **Code: BT03304**

Total Theory Periods: 24 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70 **Minimum Marks: 25**

Course Outcomes:

1. CO1: Understand working of logic gates.
2. CO2: Design and implement Combinational logic circuits.
3. CO3: Design and implement Sequential logic circuits.
4. CO4: Analyze Analog to Digital conversion and Digital to Analog Convertor circuit.
5. CO5: Construct a small memory subsystem.

UNIT I:

Fundamentals of Digital Systems and logic families (8 Hours)

Digital signals, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT II:

Combinational Digital Circuits (7 Hours)

Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De Multiplexer/ Decoders, Adders, Subtractors, BCD arithmetic, digital comparator, parity checker/ generator, code converters, priority encoders, decoders, Q-M tabulation method of function realization.

UNIT III:

Sequential circuits and systems (7 Hours)

SR flip flop, JK flip flop T flip flop and D type flip flops, Applications of flip flops, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops.

UNIT IV:

A/D and D/A Converters (7 Hours) Digital to analog converters, weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters, successive approximation A/D converter, voltage to frequency and voltage to time conversion.

UNIT V:

Semiconductor Memories and Programmable Logic Devices. (7 Hours)

Memory organization, memory size, classification and characteristics of memories, Random and sequential access memory, read only memory (ROM), read and write memory(RAM), ROM as a PLD, Programmable logic array, PLA Program Table.

Text Books:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Numerical Methods **Code: BT03305**

Total Theory Periods: 24 **Total tutorial period:0**

Total Marks in End Semester Exam: 70 **Minimum Marks: 25**

Course Outcomes:

1. CO1: Determine roots of polynomials by various methods.
2. CO2: Solve system of equations by numerical methods.
3. CO3: Estimate polynomial values by various numerical methods.
4. CO4: Determine integration and integration from tabulated values of a function.
5. CO5: Solve ordinary differential equations by numerical methods.

UNIT I:

Nonlinear Equations (5 Hours): Errors in numerical calculations, Determination of roots of polynomials and transcendental equations by Bisection method, Method of Regula Falsi Position, Newton-Raphson method; convergence analysis, Solution to system of nonlinear equations by Method of iteration & Newton-Raphson Method.

UNIT II:

System of Linear Equations (5 Hours): Matrix notation, Triangular matrices, LU Decomposition of a matrix, Eigen values and eigenvectors, Solutions of linear algebraic equations by Gauss Elimination and Gauss-Jordan methods, Iterative methods-Jacobi and Gauss-Seidel methods.

UNIT III:

Interpolation and Approximation (5 Hours): Polynomial interpolation, finite differences, Backward, Forward and central difference, divided difference, Detection of errors using difference tables, Lagrange formula and Newton's formula for interpolation, Central difference interpolation formulae, Interpolation with unevenly spaced points by Lagrange's interpolation formula,.

UNIT IV:

Numerical Differentiation and Numerical Integration(5 Hours): Introduction, numerical differentiation, differentiation based on Forward differences, Backward differences and Central differences, Maximum and Minimum values of a tabulated function, Numerical Integration, Trapezoidal rule, Simpson's 1/3 & 3/8 rules.

UNIT V:

Ordinary Differential Equations(4 Hours): Numerical solution of ordinary differential equations, Taylor series method, Picard's method, Euler and Modified Euler's method, Runge-Kutta methods,

.**Text Books:**

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Ltd, Fifth Edition.
2. M. K. Jain, S. R. K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering computation", New Age International.

Reference Books:

1. C. F. Gerald and P. O. Wheatley, "Applied Numerical Analysis", Pearson Education, Sixth edition.
2. W. Cheney and D. Kincaid, "Numerical Mathematics and Computing", Thomson Brooks/Cole, Vikas Publishing House, Fourth edition.
3. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.

Semester: B.Tech III **Branch: Electrical Engineering Lab**

Subject: Electrical Circuit Analysis lab **Code: BT03307**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes:

1. CO1: Understand the usage of common electrical measuring instruments.
2. CO2: Evaluate the responses by applying network theorems to electrical circuits.
3. CO3: Analyze the transient and steady-state response of electrical circuits.
4. CO4: Analyze two port networks behavior by determining different parameters.
5. CO5: Verify the properties of interconnected two port networks.

List of experiments: (Minimum 10 experiments are to be performed)

1. To study the different functions of a Analog / Digital multimeters.
2. To verify Thevenin's theorem for DC/AC Circuits.
3. To verify Norton's theorem for DC/AC Circuits.
4. Determination of transient response of current in series RL circuit with step voltage input and understand the time constant concept with DC Power Supply.
5. Determination of transient response of current and voltage in series RC circuit with step voltage input and understand the time constant concept with DC Power Supply.
6. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
7. Determination of line and phase voltages in wye and delta connected three phase balanced circuits.
8. Determination of Z parameters for a dc network and computation of Y, Transmission and h parameters.
9. Determination of Y parameters for a dc network and computation of Z, Transmission and h parameters.
10. Determination of transmission parameters for a dc network and computation of Z, Y and h parameters.
11. Determination of h parameters for a dc network and computation of Z, Y and transmission parameters.
12. Determination of driving point and transfer impedances of a two port ladder network and verification with theoretical values.
13. Verification of parameter properties in inter-connected two port series networks.
14. Verification of parameter properties in inter-connected two port parallel networks.

Requirements: Voltmeter, ammeter, wattmeter, power factor meter, Resistors, Inductors, Capacitors, Lamp load, DC supply, Three phase supply, Three-phase autotransformer, Multimeter, Simulation tools like SCILAB, MATLAB, PSIM, MULTISIM

Reference Books:

1. S. K. Bhattacharya, "Experiments in basic electrical engineering", New Age International, 2007.
2. Mehta and Gupta, "Basic shop practical", Dhanpat Rai Publishing Company (P) Ltd-New Delhi, 2003
3. N. K. Jain, "Practical in electrical engineering", Jain Book Depot

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Electrical Machines Laboratory - I **Code: BT03306**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes:

1. CO1: Perform various tests on single and three phase transformer.
2. CO2: Connect and operate three phase transformer in various configurations.
3. CO3: Perform speed control on DC machine.
4. CO4: Perform various tests on DC machine.

List of experiments: (Minimum 10 experiments are to be performed)

1. To determine the equivalent circuit parameters of a single phase transformer.
2. To determine the voltage regulation of a single phase transformer operating at lagging and upf condition.
3. To determine the efficiency of a single phase transformer under different loading condition
4. To perform the tests required for parallel operation of transformers.
5. To perform parallel operation of two single phase transformer.
6. To study the voltage/current ratios for different types of three phase transformer connection.
7. To perform Back to Back test on two single phase transformer.
8. To perform 3- phase to 2- phase conversion (Scott connection)
9. To study the various routine tests performed on three phase transformers as per IS code.
10. To determine the armature & field winding resistance of D.C machine by voltmeter/ammeter method.
11. To determine the magnetization or Open circuit characteristics of a D.C machine
12. To perform load test on D.C shunt generator.
13. To perform Swinburne's test a D.C machine & calculate its efficiency at full load operating condition.
14. To study three point and four point motor starters and observe its impact on the motor staring current.
15. Speed control of a D.C shunt motor by

(a) Varying field current with armature voltage kept constant

(b) Varying armature voltage with field current kept constant.

16. To study the reversal of D.C shunts motor.

Requirements:

Single Phase Transformer, Three Phase Transformer, Three Phase Auto Transformer, DC Shunt Generator Set, DC Shunt Motor, DC series Motor, Ammeters (AC & DC), Voltmeter (AC & DC), Wattmeter, Tachometer

Reference Book:

1. S. G. Tarnekar and P. K. Kharbanda, "Laboratory courses in electrical engineering", S. Chand & Company Ltd.

Semester: B.Tech III **Branch: Electrical Engineering**

Subject: Digital Electronics Lab **Code: BT03308**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes:

1. CO1: Develop circuits from truth tables using basic gates.
2. CO2: Develop circuits from MSI ICs.
3. CO3: Summarize the truth table of various flip flops.
4. CO4: Design a counter from a sequence diagram.
5. CO5: Examine functioning of A/D converter.

List of experiments: (Minimum 10 experiments are to be performed)

1. To Verify the Properties of NOR & NAND Gates As Universal Building Block.
2. Realization of Boolean Expression Using NAND Or NOR Gates.
3. To Construct X- OR Gate Using Only NAND Or NOR Gates Only.
4. To Construct a Half Adder Circuit. And Logic Gates And Verify its Truth table.
5. To Construct a Full Adder Circuit and Verify its truth table (Using Two X-OR And 3 nand gates).
6. To Construct a Half Subtractor Circuit. by Using Basic Gates and Verify its truth table.
7. To Construct a Full Subtractor Circuit by using Basic Gates and Verify its truth table.
8. To Construct a Circuit of 4 -Bit Parity Checker & Verify its truth table.
9. To construct a BCD Adder using MSI 4 bit parallel adder IC.
10. To Construct a Programmable Inverter Using X-OR Gates & Verify its truth table.
11. To Design a Comparator Circuit & Verify its truth table.
12. To Construct A RS Flip Flop Using Basic & Universal Gates (NOR & NAND)
13. To Construct a J.K. Master Slave Flip Flop & Verify its truth table.
14. To Verify the Operation of a Clocked S-R Flip Flop and J. K. Flip Flop.
15. To Construct a T & D Flip Flop Using J. K. Flip Flop and Verify Its Operations & truth table.
16. To design and verify the Operation of Counters.
17. Study of A/D and D/A converters.

Requirements: Bread boards, Power supplies, Logic Gates, CRO, Function Generator, Counters, and General Purpose Digital Experimental Kits.

Reference Books:

1. William Kleitz, “Lab Experiments--Digital Electronics, a Practical Approach”, Prentice Hall, 1990.

Semester: B.Tech III **Branch: Electrical Enggineering**

Subject: Applications of Numerical Methods in Open Source Software Lab **Code: BT03309**

Total Practical Periods: 24 **Total Marks: 35**

Minimum Marks: 12

Course Outcomes:

1. CO1: Develop computer programs for various numerical methods.
2. CO2: Analyze advantages of numerical methods over conventional methods.
3. CO3: Compare various algorithms for a particular method.
4. CO4: Apply numerical methods to engineering applications.

List of experiments: (Minimum 10 experiments are to be performed)

Write a program using SCILAB or C /CPP or any other programming language, ,

1. Bisection method.
2. Regula-Falsi Method.
3. Newton Raphson Method.
4. Multiplication of 2 Matrices.
5. Inversion of a Matrix.
6. Gauss Elimination Method.
7. Factorization Method.
8. Gauss Jordan Method.
9. Gauss Seidal Method.
10. Newton Forward Interpolation.
11. Lagrange's Interpolation.
12. Trapezoidal Rule for Integration.
13. Simpson 1/3 Rule for Integration.
14. Simpson 3/8 Rule for Integration,
15. Euler's Method.
16. Modified Euler's Method,

17. Runge Kutta Method.

Requirements: Lab equipped by PCs as per AICTE Norms and Open Source Softwares, SCILAB Etc.

Reference Books:

1. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.

BHARTI UNIVERSITY DURG (C.G.)
SCHEME OF TEACHING AND EXAMINATION
Courses of Study and Scheme of Examination
B.Tech (Fourth Semester-Electrical Engineering) 2021-22

	BoardofStudies (BOS)	Courses (Subject)	Course Code	Periodper Week			SchemeofExamination			Total
							Theory/Lab			
				L	T	P	ESE	CT	TA	
1.	BasicScience	Electromagnetic Fields	BT03401	3	1		70	10	20	100
2,	Electrical	Power Systems - (Apparatus and Modeling)	BT03402	3	1	-	70	10	20	100
	Electrical	Electrical Machines - II	BT03403	3	1	-	70	10	20	100
4.	Electrical	Signals and Systems	BT03404	2	1		70	10	20	100
5.	Electrical	Analog Electronics	BT03405	2			70	10	20	100
6.	Electrical	Electrical Machines II Lab	BT03406	-	-	2	35	-	15	50
7.	Electrical	Power System Lab	BT03407	-	-	2	35	-	15	50
8.	Electrical	Analog Electronics lab	BT03408	-	-	2	35	-	15	50
9.	Electrical	Virtual Lab	BT03409	-	-	-	-	-	50	50
10.	Non-Credit	Indian Culture and Contitution of India	BT03410	-	-	-	-	-	50	50
		Total Marks		13	4	6	455	50	245	750

L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment Note: Duration of all theory papers will be of Three Hours.

Note:

1. Duration of End Semester Exam of all theory papers will be of Three Hours.
2. Industrial Training of eight weeks is mandatory for B.Tech.. Student. It is to be completed in two parts.

S The first part will be in summer after IV semester after which students have to submit a training report which will be evaluated by the college teachers during B.E. V semester.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Electromagnetic Fields **Code: BT03401**

Total Theory Periods: 36 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam:70 **Minimum Marks: 25**

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

1. CO1: Compute electric field intensity for various charge distribution.
2. CO2: Compute electric potential, potential difference and energy density in the electrostatic field.
3. CO3: Use the solution of Laplace and Poisson's equations for the calculation of potential and electric field intensity.
4. CO4: Compute magnetic field intensity, magnetic flux density, force and torque for various current carrying elements.
5. 5. CO5: Analyze the time varying electric and magnetic field using Maxwell's equations under time varying conditions.

UNIT I:

Basics of Electromagnetic Fields: (6 hours)

Scalars and vectors, vector algebra, Cartesian, Cylindrical and Sphericalcoordinate systems, transformations between coordinate systems, Coulomb's law, Electric field intensity, electricfield due to point charge, line charge, continuous volume charge and surface charge.

UNIT II:

Elecric Flux and Potential: (6 Hours)

Electric flux and Electric flux density, Gauss's law and its application (symmetricalcharge distribution only),divergence and divergence theorem, Maxwell's first equation, Definition of potentialdifference and potential, potential field of a point charge, potential field between two coaxial cylinders, potentialbetween two conducting spherical shells, conservative property, potential gradient, Energy Density in theElectrostatic field.

UNIT III:

Electric current, Poisson& Laplace equations: (6 Hours)

Current and current density, continuity of current, metallicconductors, conductor properties and boundary conditions, the method of images, nature of dielectric materials,boundary conditions for perfect dielectric materials, Poisson and Laplace equation, Uniqueness theorem, examplesof the

solution of Laplace equations (one dimension only).

UNIT IV:

Magneto staticsand Magnetic Force: (6 Hours)

The steady state magnetic field, BiotSavart Law, Ampere's circuital Law,Curl, Stoke's theorem, Magnetic flux and Magnetic flux density, scalar and vector magnetic potentials, force on amoving charge, force on a differentialcurrent element, force between differential current elements, force and torqueon a closed circuit, magneticmaterials, magnetization andpermeability, Magnetic boundary conditions.

UNIT V:

Time Varying Field and Maxwell's Equations:(6 Hours)

Faraday's law of electromagnetic induction, statically anddynamically induced EMFs, displacement current, modification of Maxwell's equations under time varyingconditions (point form and integral form), Poynting Theorem and Poynting vector.

Text Books:

1. William H.Hayt and Jr. John A. Buck , "Engineering Electromagnetics", Tata McGraw-Hill
2. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
3. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

Reference Books:

1. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
2. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
3. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
4. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
5. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press,1966.
6. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational publishers, International Edition, 1971.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Power Systems–I (Apparatus and Modeling) **Code: BT03402**

Total Tutorial Periods: 12 **Total Theory Periods: 36**

Total Marks in End Semester Exam:70 **Minimum Marks: 25**

Course Outcomes: Students will be able to:

1. CO1: Describe the concept of national grid and smart grid.
2. CO2: Calculate various line parameters for different configurations of transmission lines.
3. CO3: Perform the analysis of short, medium and long transmission lines.
4. CO4: Solve the problems related to insulation resistance and capacitance calculation in underground cables.

UNIT I:

Introduction and modeling (8 hours)

Introduction to Power System: Evolution of power system, Structure of Power System, introduction of bulk Power grid and micro grid, Overview of national grid, Introduction of smart grid

Modeling of Generators and Transformers: Real and reactive capability curve of generators**,** waveform under balanced 3 phase short circuit at the terminals, Steady state, transient and sub transient equivalent circuits, phase shift in star delta transformer, 3 winding transformers, tap changing transformer.

UNIT II:

Overhead Line Components and Parameters (10 hours)

Types of conductors i.e., solid, stranded, ACSR and bundled conductors, calculation of inductance and capacitance of single and three phase lines for single and double circuit configuration, concept of GMR and GMD, Effect of earth on line capacitance, skin effect and proximity effect, types of load, voltage and frequency dependence of loads and per unit system.

UNIT III:

Transmission Line Performance Analysis (10 hours)

Classification of transmission lines ie short, medium and long lines, nominal T, nominal π, equivalent T and equivalent π circuits, Calculation of ABCD constants for short, medium and long lines,

calculation of efficiency and regulation of short, medium and long lines, Ferranti effect, Surge impedance loading.

UNIT IV:

Underground Cables (10 hours)

Classification of underground cables, components of underground cables, insulation resistance and capacitance of underground cables and their calculations, capacitance grading and inter sheath grading, capacitance of three core belted cable, dielectric loss in cable and concept of tan δ.

UNIT V:

Travelling Waves in Power System (10 hours)

Wave equation for transients in power systems, characteristic impedance, power and energy in travelling waves, calculation of reflection and refraction coefficients of current and voltage for various types of terminations i.e., open circuit, short circuit, inductive and capacitive terminations and their series and parallel combinations, junction of dissimilar lines, repeated reflections and Bewley lattice diagram, introduction of insulation coordination.

Text Books:

1. Nagarath and Kothari, "Power System Engineering", TMH publisher.
2. B. R. Gupta, "Power System Analysis and Design", S. Chand Publisher.

Reference Books:

1. Tarun Gonen, "Electric Power Transmission System Engineering and Design", CRC press, Taylor and Francis series.
2. T. K. Nagaskar and M. S. Sukhija, "Power System Analysis", Oxford University Press.
3. Jhon J. Grainger and W. D. Stevenson, "Power System Analysis", Mc Graw Hill Education
4. I. S. Jha, Subir Sen, Rajesh Kumar and D. P. Kothari, "Smart Grid Fundamentals and applications", New Age International Publication

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Electrical Machines – II **Code: BT03403**

Total Marks in End Semester Exam: 70 **Total Tutorial Periods: 0**

Total Theory Periods: 36 **Minimum Marks: 25**

Course Outcomes: At the end of this course, students will be able to:

1. CO1: Apply the concepts of AC machine windings.
2. CO2: Analyze the concepts of rotating magnetic fields and operation of three phase Induction Motors.
3. CO3: Understand the working of Single-phase induction motors.
4. CO4: Analyze the performance, and operation of A.C Commutator motor and special motors.
5. CO5: Analyze the performance, characteristics and operation of ac machines.

UNIT I:

Fundamentals of AC machine windings (7 hours)

Physical arrangement of windings in stator and cylindrical rotor, slots for windings, single turn coil - active portion and overhang, full-pitch coils, concentrated winding, distributed winding, winding axis, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor. Rotating magnetic field.

UNIT II:

Three phase Induction Motors (8 hours)

Construction, operation, Types, Torque Slip Characteristics, Starting and Maximum Torque, Equivalent circuit, Phasor Diagram, Losses and Efficiency, Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors.

UNIT III:

Single-phase induction motors (6 hours)

Constructional features, Double revolving field theory, Equivalent circuit, Determination of parameters-No load test Blocked rotor test, Cross field theory, starting methods, Characteristics and applications.

UNIT IV:

A.C Commutator motor and Special motor (7 hours)

Commutator motor- Construction, principle of operation and application of Single phase series motor, universal motor, Repulsion motor.

Special motor- Construction, principle of operation and application of Variable Reluctance motor, Stepper motor, Linear Induction motor, Permanent Magnet Brushless DC motor, Permanent Magnet Synchronous motor.

UNIT V:

Synchronous machines (8 hours)

Synchronous generators- Constructional features, types, Generated EMF, Equivalent circuit, hasor diagram, Operating characteristics, armature reaction, synchronous impedance, voltage regulation (EMF,MMF and zero power factor method), Parallel operation of alternators - synchronization and load division.

Synchronous Motor- Operation, construction**,** analysis of phasor diagram, two reaction theory, V-curves, power angle characteristics.

Text Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

Reference Books:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. S. Jaganathan, "Special Electrical Machines", Pearson Publication 1st Edition

Semester: B.Tech IV **Subject: Signals and Systems**

Total Theory Periods: 24 **Branch: Electrical Engineering**

Total Marks in End Semester Exam: 70 **Code: BT03404**

Total Tutorial Periods: 12 **Minimum Marks: 25**

Course Outcomes:

1. CO1: Understand the concepts of continuous time and discrete time systems.
2. CO2: Analyze the behavior of continuous time and discrete time systems.
3. CO3: Evaluate and analyze the solution of systems using z-Transforms.
4. CO4: Analyze and design systems in complex frequency domain.
5. CO5: Understand sampling theorem and its implications.

UNIT I:

Introduction to Signals and Systems (8 hours)

Introduction, Signal properties, Special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. Relation between continuous and discrete time systems, System properties: linearity, additivity and homogeneity, shift-invariance, causality, stability.

UNIT II:

Behavior of continuous and discrete-time LTI systems (8 hours)

Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections, Characterization of causality and stability of LTI systems, System representation through differential equations, State-space Representation of systems, Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT III:

Discrete linear time system analysis with z- Transforms (6 hours)

The z-Transform for discrete time signals and systems, systems described by difference equations, system functions, poles and zeros of systems and sequences, Solution by z-transform , z-domain analysis.

UNIT IV:

Fourier analysis (8 hours)

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response. The Discrete-Time Fourier Transform (DTFT), Parseval's Theorem, Discrete Fourier Transform (DFT), Circular convolution, Linear Filtering Methods Based on the DFT, Overlap-add and save methods.

UNIT V:

Sampling and Reconstruction (6 hours)

The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold, Aliasing and its effects. Introduction to the applications of signal and system theory to communication systems, Sinusoidal Amplitude Modulation and demodulation, Pulse-Amplitude Modulation

Text Books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.

Reference Books:

1. H. P. Hsu, "Signals and systems, Schaums series", McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Analog Electronics **Code: BT03405**

Total Theory Periods: 24 **Total Tutorial Periods: 12**

Total Marks in End Semester Exam: 70 **Minimum Marks: 25**

Course Outcomes:

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

1. CO1: Design and analyze various rectifier circuits and understand the characteristics of transistors.
2. CO2: Design and analyze amplifier circuits.
3. CO3: Understand the functioning of op-amp.
4. CO4: Analyze the linear applications of op-amp.
5. CO5: Design op-amp based circuits for various operations.

UNIT I:

Diode circuits and BJT circuits (8 Hours)

Review of half-wave and full-wave rectifiers; zener diodes; clamping and clipping circuits.

BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

UNIT II:

MOSFET circuits (7 Hours)

MOSFET structure and I-V characteristics, MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, transconductance, high frequency equivalent circuit.

UNIT III:

Differential, multi-stage and operational amplifiers (8 Hours)

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT IV:

Linear applications of op-amp (7 Hours)

Idealized analysis of op-amp circuits, inverting and non-inverting amplifier, differential amplifier, integrator, active filter, voltage regulator, oscillators (Wein bridge and phase shift).

UNIT V:

Nonlinear applications of op-amp (6 Hours):

Voltage comparator, zero crossing detector, Schmitt Trigger, waveform generator (square and triangular), precision half wave and full wave rectifiers, peak detector, level detector.

Text Books:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University, Press, 1998
2. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill.
3. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

Reference Books:

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
3. Boylestad and Nashelsky, "Electronic Devices and Circuit Theory", 8th Ed. PHI.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Power Systems Laboratory - I **Code: BT03407**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes: Students will be able to

1. Demonstrate various types of insulators used in power system.
2. Demonstrate various types of cables used in power system.
3. Measure ABCD constants of short, medium and long lines.
4. Locate fault in a length of cable.
5. Describe the various equipments/components used in transmission Sub Station.

List of experiments: (Minimum 10 experiments are to be performed)

1. To measure ABCD constants of short transmission lines.
2. To measure ABCD constants of medium transmission line.
3. To measure ABCD constants of long transmission lines.
4. To study the types of cables.
5. To locate fault in cable by Murray loop test.
6. To study the types of insulators ie pin insulator and string insulator.
7. To study Ferranti effect.
8. T measure capacitance between conductor-conductor and conductor-earth.
9. Comparison of GMD and GMR for different groups of conductors.
10. To study the Bus Bar arrangement of college power supply Sub Station.
11. To draw the lay out diagram of college power supply system.
12. To draw the lay out diagram of 132/220/400 KV transmission Sub Station.
13. Technical visit of nearby transmission Sub Station.
14. To study Lightning Arrester and Surge Absorbers.

*** All study experiment must involve physical demonstration/simulation.

Requirements: Transmission line trainer, Power system simulation software like MATLAB/Mi Power or equivalent. Pin type insulator, String insulator, Pieces pf various types of cables, Ammeter, Voltmeter, Multimeter and Wattmeter, Resistors, Inductors, Capacitors and Power supplies.

Reference Books:

1. C. L. Wadhwa, "Electrical Power Systems", New Age International Publishers.
2. Ashfaq Hussain, "Electrical power Systems", CBS Publishers.
3. J. Arrillaga and N. R. Watson, "Computer Modelling of Electrical Power Systems", Wiley International Publisher.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Electrical Machines Lab – II **Code: BT03406**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes:

The students will

1. CO1: Get an exposure to common electrical equipment and their ratings.
2. CO2: Perform various tests on three phase induction motor.
3. CO3: Understand the usage of common electrical measuring instruments.
4. CO4: Perform speed control on induction motor.
5. CO5: Determine the voltage regulation of 3 phase alternator by different methods.

List of experiments: (Minimum 10 experiments are to be performed)

1. To determine the equivalent circuit parameters of 3-phase induction motor by No-Load and Block Rotor test.
2. Measurement of Speed of Induction Motor by Measuring Rotor Frequency.
3. To study the speed control of a three phase slip ring I.M by adding external resistance to the rotor circuit.
4. To Study DOL starter and provide connection to 3- phase Induction motor.
5. Speed reversal of 1-phase induction motor.
6. Characteristics of stepper motor.
7. Measurement of circuit Constant of 1-phase induction motor.
8. To study synchronization of two alternators with each other and effect of change in excitation and speed (frequency) on load sharing.
9. To determine the voltage regulation of 3 phase alternator by EMF method.
10. To plot the V and inverted V- curve of synchronous Motor at No Load, and Full Load.
11. Determination of the Xd & Xq of synchronous machine.
12. Determination of zero sequence reactance by synchronous machine.
13. To Study Star-Delta starter and provide connection to 3-phase Induction motor.
14. To study speed control of Induction motor by Cascade connection.
15. To determine the voltage regulation of 3 phase alternator by direct loading.
16. To determine the voltage regulation of 3 phase alternator by ZPF method.

Requirements:

1. 3-Phase Alternator
2. 1-Phase Induction motor,
3. 3-Phase Induction Motor (Slip-ring & cage)
4. DOL starter
5. Single phase variac
6. Three phase variac
7. Stepper Motor
8. Ammeter, Voltmeter, wattmeter
9. Synchronous Motor
10. Rheostats, resistive Load.

Reference Books:

1. Yash Pal, "A Reference Book on Experiments with Basic AC/DC Circuits and Electrical Machines", Kindle Edition.
2. D. P. Kothari and B. S. Umre, "Laboratory manual for Electrical machines", J. K. International Publishing House Pvt. Ltd.

Semester: B.Tech. IV **Branch: Electrical Engineering**

Subject: Analog Electronics Lab **Code: BT03408**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 35**

Minimum Marks: 12

Course Outcomes:

Students will be able to:

1. CO1: Design and test rectifiers, clipping circuits, clamping circuits and voltage regulators.
2. CO2: Design, test and evaluate BJT amplifiers in CE configuration.
3. CO3: Compute the parameters from the characteristics of BJT and MOSFET devices.
4. CO4: Evaluate characteristics of the operational amplifiers.
5. CO5: Design various applications of operational amplifiers.

List of experiments: (Minimum 10 experiments are to be performed)

1. Design half wave and full wave rectifiers and determine ripple factor, rectifier efficiency and regulation
2. Design and set up diode clipping and clamping circuits.
3. Determine Zener diode characteristic and determine line and load regulation characteristics using it as a voltage regulator
4. Design and set up the BJT common emitter amplifier with and without feedback and determine the gain- bandwidth product from its frequency response.
5. Design and measure the frequency response of an RC coupled amplifier using BJT.
6. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
7. Design, setup and plot the frequency response of MOSFET amplifier and obtain the bandwidth.
8. Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters - drain resistance, mutual conductance and amplification factor.
9. Evaluate characteristics of the non-ideal operational amplifiers - Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product.
10. Design and realize inverting and non-inverting amplifier using 741 op-amps and obtain their frequency responses.
11. Design and verify the operation of adder and subtractor circuit using op amp 741.
12. Design and verify the operation of a differentiator and integrator circuits using op amp IC 741 and show that they act as a high pass filter and low pass filter respectively.
13. Design and realize a voltage comparator using op amp 741.

14. Design and realize a wein-bridge oscillator using op amp 741.
15. Design and realize a phase shift oscillator using op amp 741.
16. Design and realize a square wave generator using op amp 741.

Requirements:

Circuit components, Breadboard, Hook-up wire, Power supply, Digital multimeter, CRO, DSO, Function generator.

Semester: B.Tech IV **Branch: Electrical Engineering**

Subject: Virtual Lab **Code: BT03409**

Total Practical Periods: 24 **Total Marks in End Semester Exam: 50**

Minimum Marks: 12

Course Outcomes:

Students will be able to

1. CO1: Develop the simulation models of electrical machines, power system circuits and networks.
2. CO2: Analyze the tests conducted in the electrical machines.
3. CO3: Evaluate the behavior of magnetic field in the machines.
4. CO4: Design the digital circuit using gates.
5. CO5: Justify the theorems by constructing various circuits and models

List of experiments: (Minimum 10 experiments are to beerformed)

Power System lab- link - http://vp-dei.vlabs.ac.in/Dreamweaver/

1. To study the Ferranti Effect of transmission line/cable. (Available- Video/ Simulation)

To determine positive sequence, negative sequence and zero sequence

1. reactance of an alternator.(Available- Video/ Simulation)

Electrical machine lab- link - http://em-coep.vlabs.ac.in/

1. Load Test on Separately Excited DC Motor. (Available – Simulator)
2. Speed Control of Separately Excited DC Motor. (Available – Simulator)
3. No Load Test on Three Phase Induction Motor. (Available – Simulator)
4. Blocked Rotor Test on Three Phase Induction Motor. (Available – Simulator)
5. Open Circuit Test on Three Phase Alternator. (Available – Simulator)
6. Short Circuit Test on Three Phase Alternator. (Available – Simulator)
7. Load Test on Three Phase Alternator. (Available – Simulator)
8. V and Inverted V curves of Synchronous Motor. (Available – Simulator)

Electrical Machine lab – link - http://vem-iitg.vlabs.ac.in/

1. To study the generation of magnetic field in a single coil system due to DC and AC current. (Available–Simulator)
2. To study the behaviour of rotating magnetic field in a two coil system due to AC current. (Available – Simulator)
3. To study the behaviour of rotating magnetic field in a three coil system due to AC current. (Available – Simulator)
4. To measure the DC resistance of stator winding of the induction motor. (Available – Simulator)
5. To start the induction motor by connecting external rheostat to the stator winding. (Available – Simulator)
6. To start the induction motor using 3-phase auto-transformer. (Available – Simulator)
7. To start the induction motor using 3-phase auto-transformer. (Available – Simulator)

Digital Electronics and Logic Design – link - http://vlabs.iitb.ac.in/vlabs-dev/labs/dldgates/labs/index.php

1. Design of Multiplexer circuit using gates. (Available – Simulator)
2. Design of Multiplexer circuit using universal logic gates. (Available – Simulator)
3. Design of Demultiplexer circuit using basic logic gates. (Available – Simulator)
4. Design of Demultiplexer circuit using universal logic gates. (Available – Simulator)
5. Application of Multiplexer. (Available – Simulator)

Circuit and Network Laboratory – link - http://ssl-iitg.vlabs.ac.in/

1. Verification of Reciprocity Theorem. **(AvailableSimulator)**
2. Verification of Maximum Power Transfer Theorem. (Available – Simulator)
3. Determination of different parameters of Two-port network and verification of their interrelations. (Available –
4. Simulator)

Note- The experiments are to be involved as the virtual lab while updating of the experiments.

Requirements:

1. Virtual Lab – vlab.co.in
2. Adobe Flash Player

Reference Books:

1. S.G. Tarnekar & P.K. Kharbanda, "Laboratory courses in electrical engineering"
2. Ashfaq Hussain, "Electrical power systems", CBS Publications.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers
4. Morris Mano, "Digital Logic and Concept design", PHI Publications
5. A. K. Sawhney, "A Course In Electrical And Electronics Measurement And Instrumenation", Dhanpat Rai Pbs.

BHARTI UNIVERSITY DURG (C.G.)

SCHEME OF TEACHING AND EXAMINATION

B.Tech (Fifth Semester-Electrical Engineering) 2021-22

Courses of Study and Scheme of Examination

Sl.No.	BoardofStudies	Courses(Subject)	CourseCode	L	T	P	Theory/Lab			Total Marks
							ESE	CT	TA	
1.	Electrical Engg.	Control System	**BT03501**	3	1	-	70	10	20	100
2.	Electrical Engg.	Power System Analysis	**BT03502**	3	1	-	70	10	20	100
3.	Electrical Engg.	Power Electronics	**BT03503**	3	1	-	70	10	20	100
4.	Electrical Engg.	Electrical Measurements	**BT03504**	2	1	-	70	10	20	100
5.	Electrical Engg.	**Professional Elective –I(Refer Table I) BT03505**		2	0	-	70	10	20	100
6.	Electrical Engg.	Control System LAB	**BT03506**	-	-	2	35	-	15	50
7.	Electrical Engg.	Electrical Measurements LAB	**BT03507**	-	-	2	35	-	15	50
8.	Electrical Engg.	Power Electronics Lab	**BT03508**	-	-	2	35	-	15	50
9.	Electrical Engg.	Project-I based on Summer Internship/ Industrial Training	**BT03509**	-	-	2	-	-	50	50
10.	Non-Credit	Environmental Studies	**BT03510**	-	-	2		-	50	50
			Total	**13**	**4**	**10**	**455**	**50**	**245**	**750**

Table I (Professional Elective I)

S.N.	Board of Studies	Course Code	Subject
1	Electrical Engg.	BT03505(1)	Analog and Digital Communication
2	Electrical Engg.	BT03505(2)	Computer System Architecture
3	Electrical Engg.	BT03505(3)	Power Plant Engineering
4	Electrical Engg.	BT03505(4)	Electric Machine Design

Lecturer ,T – Tutorial, P – Practical , CT –ClassTest ESE – End Semester Exam TA – Teacher's Assessment

Note: (1) $1/4^{th}$ of total strength of students subject to minimum of 20 students is required to offer and elective in the college in a particular academic session.

(2) Choice of elective course once made for an examination cannot be changed in future examinations.

Semester - B. Tech V **Branch : Electrical Engineering**

Subject: Control System Engineering **Code: BT03501**

Total Theory Periods : 36 **Total Tutorial Periods: 12**

Total marks in End semester Exam : 70

Minimum Marks: 25

Course Outcomes: After completing this course students will be able to:

CO Number	Course Outcomes Statements	Knowledge level
CO1	Classify, model and obtain simplified representation in blocks and signal flow graphs.	3
CO2	Appreciate the role of feedback in the systems	3
CO3	Explain the working of different control devices like Servo Motor, Synchros and Tacho Generator.	2
CO4	Analyze the physical systems in time domain and Construct the root locus plot	3
CO5	Determine the stability of systems using frequency response techniques.	3
CO6	Design different compensators for system.	3

UNIT I:

Introduction to Control problem **(10 Hrs)**

Open Loop and closed control systems and their differences; Classification of control systems; Industrial control examples;Mathematical models of Translational and Rotational mechanical systems, thermal systems, liquid level systems, systems with dead time.

Block diagram representation of systems; System representation by Block Diagram and reduction using block diagram algebra; System representation by Signal Flow Graph and gain evaluation using Mason's gain formula.

UNIT II:

(a) Feedback Characteristics (8 Hrs)

Effects of feedback onStability, steady state accuracy, transient accuracy, disturbance rejection, insensitivity to parameter variation.

(b) Control Hardware and their Models

Working and Transfer Function of DC Servo motor, AC Servo motor and their comparison; Synchro Transmitter and Receiver working and applications; Tacho Generators working and applications

UNIT III:

Time Response Analysis (10 Hrs)

Standard test signals; Time response of second order systems; Time domain specifications; Steady state response; Steady state errors and error constants; Effects of proportional derivative and proportional integral controllers, the concept of stability; Routh stability criterion; absolute and relative stability.

Root Locus Technique: The root locus concept; construction of root loci; effects of adding poles and zeros to G(s)H(s) on the root loci

UNIT IV:

Analysis in Frequency domain (10 Hrs)

Introduction to frequency response analysis and it's specifications; Polar Plots;Nyquist Plots; Application of Nyquist criterion to find the stability, gain and phase margins.

Bode diagrams concepts and construction methods; Determination of stability, gain margin and phase margin using Bode diagram.

UNIT V:

Introduction to design (10 Hrs)

Compensator design (Cascade Lag, Cascade Lead, Cascade Lag-Lead) using root locus plots; Compensator design (Cascade Lag, Cascade Lead, Cascade Lag-Lead) using Bode plots.

Text Books:

1. Control Systems M. Gopal: Tata McGraw-Hill, 1997.

2. Modern Control Engineering K. Ogata, PHI, Fourth edition. 2003

Reference Books:

1. Control Systems Engineering: I.J. Nagrath and M. Gopal; New Age Intenational Publishers, Third edition, 2002.
2. Control system Engineering:. K. Bhattacharya, Pearson, Second edition
3. Control Systems:Dhanesh N. Manik, Cengage Learning.
4. Automatic control systems: Benjamin C. Kuo, Prentice Hall of India, 2002.

Branch: Electrical Engineering **Semester: V**

Subject: Power System Analysis **Code: BT03502**

Periods per week (L-T-P):(3-1-0) **Class Test to be conducted: 2 (Minimum)**

Assignment to be submitted: 02 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-2] **Minimum Marks: 25**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Unit	CO Statement	Knowledge Level
1	Develop reactance diagram and estimate fault current for three phase short circuit fault on Power System.	3
2	Develop sequence networks of power system using the sequence networks of different components like transformers, transmission line, alternators etc.	3
3	Evaluate the fault currents for different unsymmetrical faults on Power System.	5
4	Apply numerical methods to analyze a power system in steady state	3
5	Apply stability criterion to analyze stabilityof Power Systems	3

UNIT I

Symmetrical Faults: Single line diagram, per unit quantities,per unit impedance of three phase transformer, expression for three phase power in p.u. impedance diagram and reactance diagram of power system, computation of voltage and current at various locations of power system using reactance diagram, three phase short circuit on power system, Calculation of different current ratings and interrupting capacity of circuit breaker. **[7 Hrs.]**

UNIT II

Symmetrical Components: Expression for positive, negative & zero sequence components, existence of sequence components of current & voltages for three phase circuit, expression for three phase power in

terms of symmetrical components, sequence networks of unloaded three phase alternator, three phase transmission line and three phase transformers, development of sequence networks of power system[7 Hrs.]

UNIT III

Unsymmetrical Faults: Single line to ground fault, line to line fault, double line to ground fault on unloaded generator, unsymmetrical faults through impedance on unloaded generator, unsymmetrical faults on power system, open conductor faults.**[8 Hrs.]**

UNIT IV

Power Flow Analysis: Introduction, bus classification, bus admittance matrix, real and reactive power balance equations at a node, load and generator specifications, application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods (Flow chart and computational procedure) for the solution of the power flow equations, computational issues in large-scale power systems.**[7 Hrs.]**

UNIT V

Power System Stability: The stability problem, steady-state stability, transient stability, swing equations of a synchronous machine connected to an infinite bus, power angle curve, steady-state stability criterion, equal area criterion of stability, application of equal area criterion, critical clearing angle. **[7 Hrs.]**

Text Books:

1. Elements of power system analysis by W.D. Stevenson (4th Ed. Mc Graw Hill)
2. Power System Engg. by I.J. Nagrath& Kothari (Tata McGraw Hill).

Reference Books:

1. Electrical Power System by Ashfaq Hussain (4th Ed. CBS Pub. & Dist.)
2. Power System Analysis and Design by B.R. Gupta (3rd Ed S. Chand)
3. Power System Engg. by A. Chakrabarti, M.L. Soni,P.V.Gupta, V.S.Bhatnager(6th Ed DhanpatRai& Co.)

Branch: Electrical EngineerinG **Semester: V**

Subject: Power ElectronicS **Code: BT03503**

Periods per week (L-T-P):(3-1-0) **Class Test to be conducted: 2 (Minimum)**

Assignment to be submitted:02 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20] Minimum Marks: 25

COURSE OBJECTIVES:

After successful completion of this course, the student will be able to:

Unit	CO Statement	Knowledge Level
1	Describe and compare the operating characteristics of different power semiconductor switching devices.	2
2	Analyze the operation and performance of different types AC to DC Converters.	4
3	Analyze the operation and performance of different types of DC to DC Converters.	4
4	Analyze the operation and performance of different types DC to AC Converters	4
5	Analyze the operation and performance of different types AC to AC Converters	4

UNIT I: Power Semiconductor Devices : Silicon Controlled Rectifier (SCR): Structure, Operation, V-I Characteristics, Switching Characteristics, triggering methods, protection. Modern Power Electronics Devices: Power MOSFET, IGBT Operation and characteristics.

UNIT II :

AC to DC Converters: Single Phase Half wave controlled Full Controlled and Half Controlled Converters with R, RL and RLE Load, with and without freewheeling diode, Effect of source inductance, Dual Converters in circulating and Non-Circulating mode, Three Phase Half wave, half and fully controlled Bridge Converter.

UNIT III :

DC to DC Converters: Principle of chopper operation, control strategies, Chopper Configuration, Buck, Boost, Buck-Boost Converter, Working principle of Voltage commutated, Current commuted and Load commuted chopper.

UNIT IV :

DC to AC Converters: Single phase Voltage Source Inverter, Single phase Current Source Inverter, Voltage& harmonic control, PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM, PWM with Uni-polar and Bipolar Voltage Switching, three phase voltage source inverters (both120^o mode and 180^o mode).

UNIT V:

AC to AC Converters: AC Voltage Controller: Phase Control and Integral Cycle Control, Single phase AC voltage controllers, Sequence Control for output voltage regulation, Three phase a c regulator, Cyclo-converter: Basic principle of operation, step-up and step down single-phase to single-phase cyclo-converter.

Text Books:

1. "Power electronics Circuits, Devices and Applications", Muhammad .H. Rashid, PHI pbs.3rd Edition.
2. "Power Electronics", Dr. P.S. Bhimbra, Khanna Publishers, 3rd Edition.

Reference Books:

1. "Power Electronics Converters, applications and Design" Mohan, Undeland, Robbins, John Wiley& Sons, 3rd Edition.
2. "Power Electronic Systems: Theory and Design", JP Agarwal, 1st edition, Pearson Education.
3. "Power Electronics", M.D.Singh and K.B. Khanchandani, Mc Graw Hill India.
4. "Power Electronics, Principles and Applications", Joseph Vithayathil, McGraw Hill Series, 6th Reprint.
5. "Power Electronics: Converters, Applications and Design", Ned Mohan, Tore. M. Undeland, William. P. Robbins, John Wiley and Sons, Third edition.

Branch: Electrical Engineering **Semester: V**

Subject: Electrical Measurements & Measuring Instruments **Code : BT03504**

Total Theory Periods: 32[2-1] **Total Tutorial Periods: 08**

Assignments: Two (Minimum) **Class Tests: Two (Minimum)**

Minimum Marks: 25

Course Outcomes: At the end of the course, the students should be able to:

CO	CO STATEMENTS	Knowledge Level
1	Make use of suitable methods for the measurement of resistance.	3
2	Derive the balance equations of an AC bridge and evaluate unknown parameters by balancing the bridge.	5
3	Perform amplitude, frequency, and phase measurements using an oscilloscope and to make use of Lissajous figures for phase and frequency measurements.	3
4	Distinguish between the types of measuring instruments and use them for the measurement of Electrical quantities.	4
5	Test and calibrate ammeter, voltmeter, and wattmeter and energy meter.	6

UNIT- I

Measurement of Resistance: [08]

Classification of resistances (low, medium and high), measurement of resistance by volt drop method, loss of charge method, Wheatstone's bridge, Kelvin's double bridge, Megger and ohmmeter, AC Potentiometers and their use for calibration of meters (ammeter, voltmeter and wattmeter).

UNIT-II

AC Bridges: [08]

Measurement of inductance (self and mutual) and capacitance by AC bridges: Hay's, Maxwell's, Anderson, Desauty'sbridge, Schering bridge, Oven's bridge and Heaviside bridge and its modification,

Wein's bridge for measurement of frequency, Wagner earthing device.

UNIT- III

Detectors And Magnetic Measurement: [08]

Construction, theory and operation of D'Arsonval andvibration galvanometer, Oscilloscope – Basic Principle, CRT feature, Block diagram of Oscilloscope, Triggered sources, Measurement of frequency and phase by Lissajous Figures.

UNIT-IV

Measuring Instruments: [08]

Classification, operation and working principle of PMMC, MI and dynamometer type instruments, controlling, damping and balancing devices, single-phase and three-phase electrodynamometer power factor meter, frequency meters: electrical resonance type, electrodynamometer, ratio-meter type. Phase sequence meter, maximum demand indicator.

UNIT-V

Power And Energy Measurement: [08]

Construction and principle of dynamometer and induction type wattmeter, measurement of power in a three-phase circuit by using single-phase wattmeters, wattmeter errors, low power factor wattmeter, testing of wattmeter, single and poly-phase energy meters, testing of energy meters.

Text Books:

1. "A Course In Electrical And Electronics Measurement And Instrumentation", Sawhney, DhanpatRaiPbs.
2. Electrical Measurement and Measuring Instruments", Golding, CBS Publication
3. Electronic Instrumentation, H. S. Kalsi, TMH Publications

Reference books:

1. "A Course In Electrical And Electronics Measurement And Instrumentation", J. B. Gupta, KatariaPbs.

2. “Electric Measurements”, Harris, Wiley Publication
3. “Electrical Measurements and Instrumentation, Cooper, TMH Publications

Branch: Electrical Engineering **Semester: V**

Subject: Analog and Digital Communication(Professional-Elective) **Code: BT03505(1)**

Periods per week (L-T-P):(3-1-0) **Class Test to be conducted: 2 (Minimum)**

Assignment to be submitted:02 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20] **Minimum Marks: 25**

Course Outcomes: After successful completion of this course, the student will be able to:

Course Code	CO Statement	Knowledge Level
1	Explain the modulation process and different types of modulation.	2
2	Analyze the angle modulation and compare different type of angle modulation useful	4
3	Analyze Pulse modulation and multiplexing of signals.	4
4	Explain PCM and Digital modulation, and its mechanism..	2
5	Evaluate the channel capacity and coding efficiency	5

UNIT I

Amplitude Modulation: Need of modulation, Amplitude modulation, Single tone and multi tone amplitude modulation, Amplitude Modulation Index, power relation. Generation and detection of AM wave, Suppressed carrier modulation and detection techniques**.**

UNIT II

Angle Modulation: Mathematical equation of frequency modulation (FM), frequency spectrum, phase modulation (PM), relationship between PM and FM, pre-emphasis and de-emphasis, adjacent channel interference, comparison of narrow band and wide band FM, generation of FM.

UNIT III

Pulse Modulation System: Sampling theorem, Sampling of Low Pass and band pass signals, Aliasing, Aperture effect, Basic principles of PAM, PWM and PPM, their generation and detection, FDM, TDM, Comparison of TDM and FDM.

UNIT IV

PCM and Digital Modulation Techniques: Quantization, PCM, PCM generator, Quantizer, Transmission band width in PCM, PCM receiver, quantization noise/error in PCM, DPCM.

Introduction To Digital Modulation: Types of digital modulation techniques, Fundamentals of binary ASK, PSK and FSK, Generation of BASK, BPSK and BFSK and their coherent detection techniques.

UNIT V

Information Theory: Introduction, Sources of information, Contents in DMS, Contents of a symbol, Information rate, Discrete memory less channel,mutual information, Channel capacity, Source coding, Coding efficiency.

Text Books:

1. Principles of Communication Systems –Taub and Shilling, Tata Mc GrawHill.
2. A Text Book of Analog & Digital Communication –P. Chakrabarti, DhanpatRai&Co.

Reference Books:

1. "Electrical Communication Systems", Kennedy,TMH.
2. "Digital Communications" Sanjay Sharma, S.K. Kataria& Sons, NewDelhi

Branch: Electrical Engineering **Semester: V**

Subject: Computer System Architecture (Professional-Elective) **Code: BT0350(2)**

Periods per week (L-T-P):(3-1-0) **Class Test to be conducted: 2 (Min)**

Assignment to be submitted: 2 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20] **Minimum Marks: 25**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

Course Code	CO Statement	owledge Level
1	Develop micro operation for a given digital circuit.	3
2	Develop micro operations for various computer instructions.	3
3	Program a basic computer	4
4	Develop micro operations for a give microinstruction.	3
5	Analyse the CPU functioning	4

UNIT I

Register Transfer and Micro-Operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfer, three state buffers, memory transfer, micro operations, binary adders, binary adder subtractor, binary incrementer circuits. Logic Micro operations, hardware implementation, Shift micro operations, hardware implementation, Arithmetic and Logical Unit.

UNIT II

Basic Computer Organization :

Instruction codes, stored program organization, indirect address. Computer registers, common bus system. Computer instructions, instruction set completeness. Timing and control unit, fetch and decode, determining type of instruction, register reference instructions, memory reference instructions. Input-output configuration, input-output instructions, program interrupt, interrupts cycle.

UNIT III

Programming the Basic Computer

Introduction, Machine language, assembly language, rules of the language, translation to binary, Program loops, Programming arithmetic and logic operations, Logic operations, Shift operations.

UNIT IV

Micro Programmed Control

Control memory, address sequencing, conditional branching, mapping of an instruction, subroutine, micro-program example, microinstruction format, symbolic microinstructions, fetch routine, symbolic micro-program, binary micro-program, Design of control unit, Micro program sequencer.

UNIT V

Central Processing Unit

General register organization, control word, Stack organization, Register stack, memory stack, reverse polish notation, Instruction format, 3-2-1-0 address instructions. Addressing modes, Data Transfer and Manipulation, data transfer instructions, data manipulation instructions, arithmetic instructions, logical and bit manipulation instructions, shift instructions. Program control, status bit conditions, conditional branch instructions, subroutine-call-return instructions.

Text Books:

1. Computer System Architecture by M. M. Mano
2. Computer Architecture and Organization, J.P. Hayes Int'1 student edition, McGraw – Hill.

Reference books:

1. Structured computer organization 3rd Edn by A. Stannabaum.
2. Computer Organization by V.C.Hamacher et al McGraw.
3. Introduction of Digital computer Design by V. Rajaraman & T.Radhakrishnman.
4. Analog computation and simulation by V. Rajaraman PHI

Branch: Electrical Engineering **Semester:V**

Subject: Power Plant Engineering (Prof. Elective) **Code:BT03505(3)**

Periods per week (L-T-P):(2-0-0) **Number of class Test to be conducted: 2**

No. of assignment to be submitted:02 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70,CT-10, TA-20] **Minimum Marks: 25**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowle dge Level
1	Illustratethe working of Coal Based Thermal Power Plants	2
2	Explain theGas Turbine and Combined Cycle Power Plants	2
3	Explainthe functioning of Nuclear Power Plants	2
4	Distinguish andclassify Renewable Energy sources.	4
5	Evaluate related to plant economics, and propose pollution control techniques	6

Unit 1:

Coal Based Thermal Power Plants

Layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems

Unit 2:

Gas Turbine and Combined Cycle Power Plants

Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

Unit 3:

Nuclear Power Plants

Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

Unit 4:

Power from Renewable Energy

Hydroelectric power plants, classification, typical layout and components, principles of Wind, Tidal, Solar PV and Solar Thermal, Geothermal, Biogas and Fuel Cell power systems

Unit 5:

Energy, Economic and Environmental Issues of Power Plants

Energy, economic and environmental issues, power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

Text Books:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. Tanmoy Deb, Electrical Power Generation-Conventional and Renewable, Khanna Publication 2017
3. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Reference Books:

1. B.R. Gupta, Generation of Electrical Energy,7th edn, S. Chand Publishing, 2017
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010

Branch: Electrical Engineering **Semester: V**

Subject: Electrical Machine Design **Code: BT03505(4)**

Periods per week (L-T-P): (2-0-0) **Class Test to be conducted: 2(min)**

No. of assignment to be submitted: 05 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20] **Minimum Marks: 25**

Course Outcomes: After competition of this course, students will be able to:

Course Code	CO Statement	Knowledge Level
1	Explain mmf calculation and modern trends in design of various types of electrical machines.	2
2	Design core, yoke, windings and cooling systems of transformers.	6
3	Design core and armature for rotating machines.	6
4	Design rotor of rotating machines.	6
5	Design and analyze the computer aided design of electrical machines.	6

UNIT-I

Basic Considerations: Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials. Calculation of total mmf and magnetizing current.**[06 hours]**

UNIT-II

Design of Transformer: Design of distribution and power transformers, Types, Classification and specifications, Design and main dimensions of core, yoke, winding, tank (with or without cooling tubes) and cooling tubes, Numerical examples.**[06 hours]**

UNIT-III:

Design of rotating machines – I: Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, election of frame size, Core and armature design of dc and 3-phase ac machines.**[06 hours]**

Unit-IV:

Design of rotating machines – II: Rotor design of three phase induction motors, Design of field system of DC machine and synchronous machines. Estimation of performance from design data **[06 hours]**

Unit-V:

Computer Aided Design: Philosophy of computer aided design, advantages and limitations.

Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure. Flow charts for the design of transformer, dc machine, three phase induction and synchronous machines. **[06 hours]**

Text Books:

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay "Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.

Reference Books:

3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C. Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.
6. A. Shanmugasundaram, G. Gangadharan, R. Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.

Branch: Electrical Engineering **Semester: V**

Subject: Control System Engineering Laboratory **Code: BT03506**

Periods per week (L-T-P): (0-2-0) **Total Lab Periods: 24**

Batch Size: 30 **Maximum Marks in ESE: 35**

Minimum Marks in ESE: 12

List of Experiments: (At least ten experiments are to be performed by each student)

1. To determine the gain of an open loop and closed loop system.
2. To study the effect of disturbance on an open loop and closed loop system.
3. To determine the transfer function of a DC servomotor.
4. Determination of transfer function of an AC servomotor.
5. Characteristics of synchro-transmitter and receiver pair.
6. To study a potentiometer as an error detector.
7. Study of a basic electrically controlled hydraulic system.
8. To Study the time response of a first and second order system.
9. Study of P, PI controller on second order system
10. Study of PID controller on second order system
11. Study of bode plot of a Type 0,Type I and Type II systems.
12. To study the lag compensator and lead compensator.
13. To study the lag-lead compensator.

Branch: Electrical Engineering **Semester: V**

Subject: Electrical Measurements & Measuring Instrument Lab **Code: BT03507**

Periods per week (L-T-P): (0-2-0) **Total Lab Periods: 24**

Batch Size: 30 **Maximum Marks in ESE: 35**

Minimum Marks in ESE: 12

List of Experiments: (At least Ten experiments are to be performed by each student)

1. To determine unknown resistance using Kelvin's Bridge.
2. To determine unknown resistance using Wheatstone Bridge.
3. To determine unknown inductance of a given coil using Maxwell Bridge.
4. To determine the inductance of the given coil using Anderson's Bridge.
5. To determine unknown capacitance of a given capacitor by Desauty's Bridge.
6. To determine capacitance of a given capacitor using Schering Bridge.
7. To determine the inductance using Owen's Bridge.
8. To determine unknown inductance using Hay Bridge.
9. To calibrate a given single phase induction type Energy Meter.
10. To find the phase sequence of the supply by the rotating type phase sequence meter.
11. To find the phase sequence of the supply by the Static type phase sequence meter.
12. To determine the unknown resistance R by Voltmeter-Ammeter Method.
13. To observe the B-H curve and hysteresis loop of agiven transformer core on CRO.
14. Measurement of high resistance by using Meggar.

Equipment/Machines/Instruments/Tools/Software Required:

Bridges, Head Phones, Transformer, Variac, Voltmeter, Ammeter, Multimeters, Resistors, DC Supply, Meggar

Recommended Books:

1. Electrical measurement & measuring instrument by A.K.Sawhney.

2. Electrical measurement & measuring instrument by J.B.Gupta

Branch: Electrical Engg. **Semester: V**

Subject: Power Electronics Lab **Code: BT03508**

Period per week (L-T-P): (0-0-2) / Week **Scheme of Examination (Laboratory):Total Marks- 50 [ESE-35, TA- 15]** **Minimum Marks: 12**

COURSE OUTCOMES:

CO Statement	Knowledge Level
Determine static characteristics of SCR,MOSFET and IGBT	5
Analyze the operation of various phase controlled rectifiers for different types of load	4
Analyze the operation of step up and step down choppers	4
Analyze the operation of series and parallel inverters	4
Simulate power converter circuits using MATLAB/PSPICE.	3

COURSE DETAILS (At least ten experiments):

1. To study and plot the V-I characteristics of an SCR.
2. To study and plot the drain characteristics of a MOSFET.
3. To study and plot the drain characteristics of a IGBT.
4. To study single-phase half-wave bridge controlled rectifier for R and RL load.
5. To study single-phase full-wave bridge controlled rectifier for R and RL load with and without freewheeling diode.
6. To study of three-phase half-wave controlled rectifier for resistive load.
7. To study of three-phase full-wave controlled rectifier for resistive load.
8. To study step down and step up chopper circuit.
9. To study Voltage commutation chopper circuits.
10. To study current commutation chopper circuits.
11. To study Single Phase series inverter with R and RL loads.
12. To study the bipolar and unipolar switching scheme of a single phase full bridge inverter using MATLAB / PSPICE simulation.
13. To study the three phase VSI for 180/120 mode of conduction using MATLAB / PSPICE simulation.
14. To study single-phase AC voltage control by using TRIAC for R and RL loads.

Apparatus Required:

1. Various Power Electronics Kits.
2. CRO
3. MATLAB/PSPICE

Name of the Program: BTech **Semester: V**

Subject: Environmental Studies **Code: BT03510**

Period per week (L-T-P): (2-0-0) / Week **Total Contact Hours: 35**

No. of assignments to be submitted: 05 **Minimum Marks: 12**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:

1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

UNIT I:

Introduction to environmental studies, ecology and ecosystems (06hours)

Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II:

Biodiversity and conservation (06 hours)

Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III:

Natural resources and environment (08 hours)

Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over- exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV:

Human communities, social issues and environment (08 hours)

Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V:

Environmental pollution, policies, legislations, assessment and practices(12 hours) Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):

On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006).*Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006).*Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971).*Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005).*Ecology and Environment*. Rastogi Publications.

BHARTI UNIVERSITY DURG (C.G.)

SCHEME OF TEACHING AND EXAMINATION

B.Tech (Sixth Semester-Electrical Engineering) 2021-22

Courses of Study and Scheme of Examination

Sl. No.	Board of Studies	Courses (Subject)	Course Code	Period per Week			Theory/Lab			Total Marks
				L	T	P	ESE	CT	TA	
1.	Electrical Engg.	Instrumentation Techniques	BT03601	3	1	-	70	10	20	100
2.	Electrical Engg.	Switchgear and Protection	BT03602	3	1	-	70	10	20	100
3.	Electrical Engg.	Microprocessor and its Applications	BT03603	3	1	-	70	10	20	100
4.	Professional Elective-II (Refer Table I) BT03604			2	1	-	70	10	20	100
5.	Open Elective – I (Refer Table II) BT03605			2	0	-	70	10	20	100
6.	Electrical Engg.	Instrumentation Techniques Lab	BT03606	-	-	2	35	-	15	50
7.	Electrical Engg.	Switchgear and Protection LAB	BT03607	-	-	2	35	-	15	50
8.	Electrical Engg.	Microprocessors LAB	BT03608	-	-	2	35	-	15	50
9.	Electrical Engg.	Programming and Simulation Lab	BT03609	-	-	2	35	-	15	50
10.	Humanities	Technical Communication and Soft Skill	BT03610	-	-	2			50	50
							490	50	210	750

L – Lecturer T – Tutorial, TA – Teacher's Assessment

P – Practical, ESE – End Semester Exam, CT –ClassTest

S.N.	Board of Studies	Subject	Course Code
1.	Electrical Engineering	Fibre Optics	BT03604(1)
2.	Electrical Engineering	Microcontroller and Embedded System	BT03604(2)
3.	Electrical Engineering	Hybrid Electric vehicle	BT03604(3)
4.	Electrical Engineering	Digital Control System	BT03604(4)

Note: (1) 1/4th of total strength of students subject to minimum of 20 students is required to offer and elective in the college in a particular academic session.

(2) Choice of elective course once made for an examination cannot be changed in future examinations.

List of Open Elective – I (Table III) (For 6th Semester)

S.N.	Board of Studies	Subject	Course Code
1	Agriculture Engg.	Food Packaging Technology	
2	Agriculture Engg	Energy Management & Audit	
3	Agriculture Engg	Energy Conservation & Management	
4	Agriculture Engg	Disaster Management	
5	Agriculture Engg	Ecology and Sustainable Development	
6	Agriculture Engg	Non Conventional Energy Sources	
7	Mechanical Engineering	Safety Engineering	
8	Mechanical Engineering	Value Engineering	
9	Mechanical Engineering	Managing Innovation & Entrepreneurship	
10	Mechanical Engineering	Environment Pollution & Control	
11	Management	Enterprise Resource Planning ((Except CSE & IT Branch)	
12	Computer Science Engg.	Artificial Intelligence	

13	Computer Science Engg	Quantum Computing	
14	Computer Science Engg	Cyber Security	
15	Civil Engg	Construction engineering and management	
16	Civil Engg	Metro system and engineering	
17	Civil Engg	Infrastructure Planning and Management	
18	Computer Science Engg	Parallel Processing & Computing	
19	Computer Science Engg	Cryptography & Network Security	
20	Computer Science Engg	Cloud Computing	
21	Computer Science Engg	Computer Networks	
22	Computer Science Engg	Internet of Things	
23	Computer Science Engg	Data Structures and Algorithms	
24	Computer Science Engg	Big Data Analytics	
25	Electrical and Electronics Engg	Electrical Estimation and Costing	
26	Electrical and Electronics Engg	Energy Auditing and Management	
27	Management	Finance Management	

28	Mechanical Engineering	Safety Engineering	
29	Electronics & Telecom.	AI and Machine learning	
30	Electronics & Telecom.	Operating Systems	
31	Electronics & Telecom.	Internet & Web Technology	
32	Electronics & Telecom.	Database Management Systems (DBMS)	
33	Electronics & Telecom.	Device Modelling	
34	Electronics & Telecom.	Introduction to MEMS	
35	Mechanical Engineering	Principles of Management	
36	Mechanical Engineering	Advanced I.C. Engines	
37	Mechanical Engineering	Mechanical Vibrations & Condition Monitoring	
38	Mechatronics	Entrepreneurship Developments	
39	Plastic Engineering	Heat Transfer Operation	
40	Plastic Engineering	Process Economics and Management	
41	Plastic Engineering	Adhesive and Surface Coating	
42	Information Technology	E-Commerce	
43	Information Technology	Industrial Economics and Management	
44	Information Technology	Project Planning & Management	
45	Information Technology	Bio-Informatics	
46	Information Technology	Management Information System	

47	**Chemical Engineering**	**Plant Utility & Safety Engineering**	
48	**Chemical Engineering**	**Environment Pollution & Control**	

.

Branch: Electrical Engineering **Semester: VI**

Subject: Instrumentation Techniques **Code: BT03601**

Periods per week (L-T-P):(3-1-0) **Class Test to be conducted: 2 (Min)**

No. of assignment to be submitted: 02 **Minimum Marks: 25**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

S.N	CO Statement	nowledge Level
1	Distinguish between CT, PT and Evaluate error presents in instruments	5
2	Measure of linear displacement, Angular displacement, pressure, force, temperature, strainby Transducers.	5
3	Make use of DAS and about varies Recorders used in industries.	3
4	Explain the architecture and I/O module of PLC.	2
5	Develop and Execute Ladder Programming in PLC.	3

UNIT I

Errors in Measuring Instruments& CT PT: Errors in measurement, general and statistical analysis of errors, Instrument transformers, errors of CTs and PTs, methods of reduction of errors of instrument transformers,Testing of CTs (Absolute and Silabee's methods), Testing of PTs: Absolute and method using wattmeter.[8]

UNIT II

Passive and Active Electrical Transducers: Resistive, capacitive, inductive, piezoelectric, selection of transducers, transducers characteristics, frequency generating transducers, pressure inductive transducers, LVDT, differential output transducer, thermistor, strain gauge, Hall effect transducers, measurement of angular and linear velocity using electrical transducers, reluctance pulse pick-ups.[10]

UNIT III

Data Acquisition System and Recorders: Introduction of DAS, Objective of DAS, Signal conditioning ofinputs, single and multi-channel DAS, Computer based DAS, Sample and hold, Multiplexing, D/A, A/Dconversion general description of Data loggers, Digital transducers, optical encoders, resistive digitalencoders, shaft encoders.Recorders: Introduction, Strip chart recorders, General description of XY recorders, galvanometer type recorders,potentiometric recorders.[7]

UNIT IV

PLC: Introduction, PLC and Operations, Basic ladder diagram, General PLC Programming Procedure, Devices to which PLC Input and Output Modules are connected.[5]

UNIT V

Basic PLC Programming and Functions: Programming On-Off inputs to produce On-Off outputs, Relation of Digital Gate Logic to Contact / Coil Logic, Creating Ladder diagrams from process control descriptions.Basic PLC Functions, Register Basics, PLC Time Functions, PLC Counter Functions.[6]

Text Books:

1. Electrical and Electronics Measurements and Instrumentation:.Purkait, B Biswas, S. Das and C. Koley,McGraw hill
2. Electronic Measurements and Instrumentation: K. Lal Kishore, Pearson.
3. Programmable Logic Controllers, John W.Webb, Ronald A. Reis, Prentice Hall .

Reference Books:

1. Electronic Instrumentation by H. S. Kalsi, McGraw Hill
2. Instrumentation Measurement and Analysis: Nakra and Chaudhry, McGraw Hill.
3. Electronic Instruments and Instrumentation Technology" by M.M.S. Anand, PHI Publications

Branch: Electrical Engineering **Semester: 6th**

Subject: Switchgear & Protection **Subject Code: BT03602**

Periods/Week: (L-T-P) (3-1-2) **Class tests 02**

Minimum number of Assignments: 02 **Scheme of Examination (Theory):**

Total Marks – 100 [ESE – 70, CT – 10, TA – 20] Minimum Marks: 25

COURSE OUTCOMES: After successful completion of this course, the students will be able to:-

S. No.	CO Statement	owledgeLevel
1	Explain working of various protective relays.	2
2	Design suitable Protection Schemes for Alternators.	6
3	Design the required Protection Schemes for various Transformers, Feeders& Transmission Lines according to their usage.	6
4	Design various Comparators for designing various relays.	6
5	Analyze various types of the circuit breakers, the arc quenchingphenomena and the protection against over voltages.	4

UNIT-I

RELAY: Terminology, Basic circuit, relay connection with trip circuit and circuit breaker, objectivesof protection, types of relay, construction and operation of instantaneous over current relay. I.DM.T. Relay, directional Unit, differential relay, percentage differential relay, Generalized torque expression, logical construction of impedance reactance, MHO and Off-set MHO Relays using generalized torque expression.

UNIT-II

Protection of Alternators and Bus Bars: Differential protection, Protection of stator against phases to ground fault, phase to phase faults, inter turn fault, protection against unbalanced loading, protection of rotor against ground fault, field failure, reverse power, back up protection, field suppression, protection of bus bars, frame leakage protection, differential protection.

UNIT III

Protection of Transformers & Feeders: differential protection of transformers for different winding configurations, difficulties encountered in differential protection and their remedies, Buchholz relay, protection of feeders, protection of ring main and parallel feeders, protection of radial feeders by over current relays, distance relays and carrier current protection scheme.

UNIT IV

Static Relays: directional relay, impedance relay, admittance relay and admittance relay, amplitude comparator, phase comparator, duality between amplitude and phase comparators.

UNIT V

Circuit Breakers and Fuses: Arc formation, arc interruption and re-striking voltage, current chopping, resistance switching, Air blast circuit breakers, minimum and bulk oil circuit breakers, SF6 and Vacuum Circuit breakers, definitions of terms in fuses, HRC fuses.

Text Books:

1. "Power system protection and switchgear", Ravindranath and Chander, TMH
2. "Power system protection", Badri Ram, TMH.
3. "Fundamentals of power system protection", Paithankar and Bhinde, PHI
4. "Switchgear and Protection" by Sunil S. Rao, Khanna Publishers

Reference books:

1. "Electrical power system", C L Wadhwa, New Age.
2. J and P switchgear handbook

Branch: Electrical Engineering **Semester: VI**

Subject: Microprocessor and its applications **Code: BT03603**

Periods per week (L-T-P):(3-1-0) **Number of class Test to be conducted: 2 (Minimum)**

No. of assignment to be submitted: 2 **Minimum Marks: 25**

Scheme of Examination (Theory): Total Marks-150 [ESE-100, CT-20, TA-30]

COURSE OUTCOMES: After successful completion of this course, the student will able to:

S.N	CO Statement	owledgeLevel
1	Explain the architecture and Software model of Intel's 8085 8-bit Microprocessor.	2
2	Develop and Execute 8085 assembly level programs and manually translate them to Machine Language Programs	3
3	Design interfacing circuit for memory and I/Os using MSI ICs.	6
4	Apply 8085 interrupt system to interface peripheral and IOs in interrupt driven data transfer mode.	3
5	Select various peripheral ICs like 8255, 8155, 8256, 8253, 8254 with 8085 Microprocessor.	3

UNIT I

Microprocessor Architecture: Brief Introduction to Microprocessors, Architecture of 8085, Pin Configuration and their Functions; internal registers & flag register, memory-stack organization, Generation of Control Signals, demultiplexing of address / data bus, Machine cycle, status and Control Signals.

UNIT II

Instruction Set and Programming with 8085: Instruction for Data Transfer, Arithmetic, Logical Operations and Branching Operation. Stacks, Subroutine and Related Instructions. Addressing Modes, Instructions Format. Simple Programs using Instruction Set of 8085.

UNIT III

Data Transfer and Device Selection: Format of Data Transfer, Modes of Data Transfer, Type of I/O Addressing, Condition of Data Transfer: Microprocessor Controlled Data Transfer/ Peripheral Controlled Data Transfer, Absolute and Linear Select Decoding, Memory and I/O Interfacing, Use of Decoders Selection.

UNIT IV

Interrupts: Restart Instruction; Hardware Implementation, Interrupt Processing; Multiple Interrupts and Priority Concepts, Interrupt Structure of 8085, Instructions related to interrupts, Pending Interrupts, Application of Interrupts and simple illustrative Programs.

UNIT V

Architecture of Peripheral Interfacing Devices: Architecture, Pin Diagram and functioning of 8155/8156, 8255 (PPI). Simple programs like Initialization and I/O operations of the ports using simple I/O mode, Timer operation of 8155. Architecture, Pin diagram & description of USART (8251). Block Diagram, Pin Configuration of Programmable Interval Timer 8253/8254:.

Name of Text Books:

1. Microprocessor Architecture, Programming and Application by R. S. Gaonkar, Wiley Eastern
2. Digital Systems – From Gates to Microprocessors by Sanjay K. Bose, New Age International Publishers.
3. Introduction to Microprocessors by Aditya P Mathur, 3rd Edition, Tata Mc Graw Hill

Name of Reference Books:

1. 8085 Microprocessor Programming & Interfacing – N.K. Srinath, PHI
2. Digital Computer Electronics – Malvino, TMH
3. Microprocessors: Theory and Applications – Intel and Motorolla, Rafiquuzzaman, PHI.
4. 0000 to 8085: Introduction to Microprocessor for Engineers and Scientists, Ghosh & Sridhar, PHI

Branch: Electrical Engineering **Semester: VI**

Subject: Instrumentation Techniques Laboratory **Code: BT03606**

Minimum Marks: 12

List of Experiments: (Minimum 10 experiments to be done from the list given below)

1. Measurement of % ratio error and phase angle error of CT.
2. Measurement of current, voltage and power using CT & PT.
3. Measurement of displacement using LVDT.
4. Measurement of force using strain gauge.
5. To Study Piezo-electric transducer.
6. Measurement of displacement using capacitive pickup.
7. To demonstrate the operation of D/A converter.
8. To demonstrate the operation of A/D converter.
9. Measurement of intensity of light.
10. Measurement of angular displacement using capacitor transducer.
11. Industrial automation demonstration through PLC.
12. Measurement of current / voltage using Hall.
13. Measurement of liquid level using capacitive pick-up.
14. Speed control of DC motor using PLC.

Branch: Electrical Engg. **Semester: 6TH**

Subject: Switchgear & Protection Lab **Code: BT03607**

Total practical periods: 30 **Scheme of Examination (Theory): Total Marks – 50 [ESE – 35, TA – 15]** **Minimum Marks: 12**

List of experiments: (To be performed minimum 10 experiments)

COURSE OUTCOMES: After successful completion of this course, the students will be able to:-

S. No.	CO Statement	owledgeLevel
1	Understand the working of various relays like IDMT relay, Instantaneous Over-current relay, etc.	2
2	Design a suitable protection scheme according to the requirement.	6
3	Design a Percentage-Biased Differential Protection Schemes for Alternators & Transformers according to its needs.	6
4	Understand the working of most important relay for Transformer i.e. Buchholz Relay.	2
5	Analyze the various protection schemes for various types of faults.	4

1. To study Over-Current Relay static type & draw characteristics.
2. To study under voltage relay electromechanical type & draw characteristics.
3. To study over voltage relay electromechanical type & draw characteristics.
4. To study IDMT Over current relay Electromechanical Type & draw current verses timecharacteristics.
5. To study IDMT earth fault relay electromechanical type draw current verses timecharacteristics.
6. To study operating characteristics of percentage-biased differential relays to plot the characteristics of percentage biased differential relay for 30%, 40%, & 20%.
7. To determine the characteristics of instantaneous relays.
8. To study Buchholz Relays.
9. To study Solid State O.C.R.
10. To study Merz Price Protection of transformer (Simulation Model).

Branch: Electrical Engineering **Semester: VI**

Subject: Microprocessors Lab **Code: BT03608**

Periods per week (L-T-P):(0-0-2) **Scheme of Examination (Theory): Total Marks-50 [ESE-35, TA-15]** **Minimum Marks: 12**

COURSE OBJECTIVES: After successful completion of this course, the student will able to:

CourseCode	CO Statement	owledgeLevel
1	Develop and execute various programs on 8085 Microprocessor kit/ 8085 Simulator.	3

List of experiments: (Minimum 10 experiments are to be performed)

1. To Transfer data into specified register.
2. To add content of two register and store result in another register.
3. To add content of two memory locations and store result in another memory locations.
4. To find 2's complement of 8 bit number stored in a memory location.
5. To mask upper nibble of the 8 bit numberstored in a memory location.
6. To transfer block of 10 data bytes from one memory location to another.
7. To transfer block of 10 data bytes from one memory location to another in reverse order.
8. To multiply two 8 bit numbers.
9. To add contents of a block of 10 data bytes.
10. To find largest among the 10 given data bytes.
11. To find number of even and odd values from a given block of data bytes.
12. Sorting given data bytes in ascending order.
13. Two 16 bit numbers are residing at some memory location, Write a program two add them up andstore the result at some other memory location.
14. To count the how many number of times even and odd PARITY bytes are appearing in 256 consecutive memory locations.
15. To convert a binary number in to its equivalent BCD.

Apparatus Required:

1. Microprocessor 8085 Kit or 8085 Simulator Software

Branch: Electrical Engineering **Semester: VI**

Subject: Programming and Simulation Lab **Code: BT03609**

Periods per week (L-T-P):(0-0-2) **Scheme of Examination (Theory): Total Marks-50**

[ESE-35, TA-15] **Minimum Marks: 12**

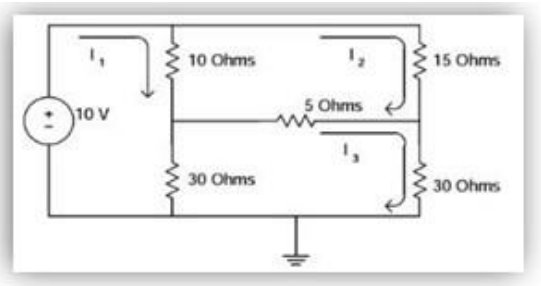
COURSE OBJECTIVES: After successful completion of this course, the student will able to:

CourseCode	CO Statement	KnowledgeLevel
1	Develop and execute various programs on MATLAB/Scilab or any other suitable Simulationsoftware	3

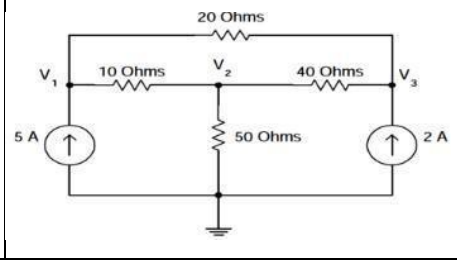
CourseOutcomes:

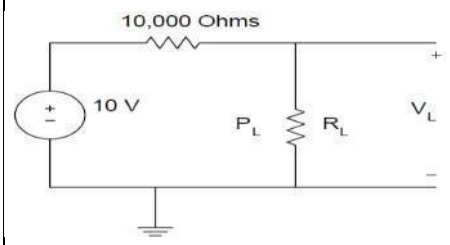
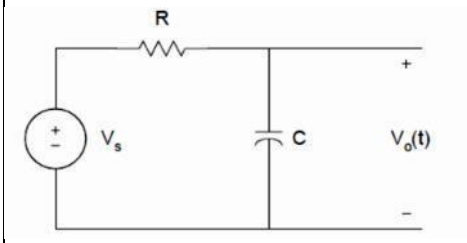
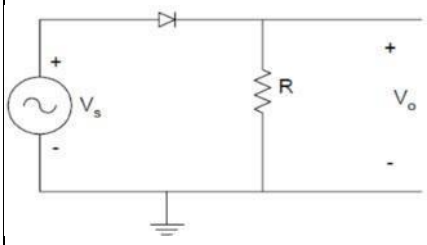
On successful completion of the Course, the student will be able to:

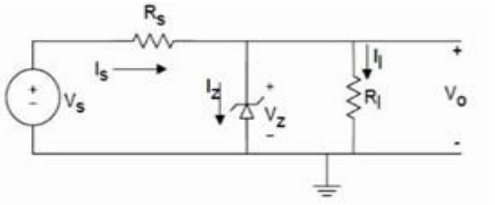
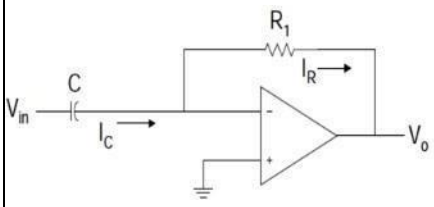
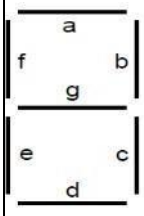
1. Understand the main features and importance of the MATLAB/ SCI LAB mathematical programming environment.
2. Apply working knowledge of MATLAB/ SCI LAB package to simulate and solve Electrical, Electronic circuits and Applications.
3. Solve, Simulate and Analyse various DC circuits.
4. Solve, Simulate and Analyse various AC circuits.
5. Solve, Simulate and Analyse various Analog and Digital Electronics circuits.
6. Solve, Simulate and Analyse simple Transformer and DC Generator circuits.

Sl. No.	Topic/Exercises
1	Ohm's law - If R = 10 Ohms and the current is increased from 0 to 10 A with increments of 2A.Write a program/ simulate to generate a table of current, voltage and power dissipation.
2	Resistances combination- Write a program/ simulate to solve the equivalent resistance of series and parallel combinations up to three resistances R1, R2 and R3.
3	KVL- Using Mesh/ loop analysis solve and simulate the given circuit to find the loop currents I1, I2 and I3. 

List of experiments: (Minimum 10 experiments are to be performed)

4	KCL- Using Nodal analysis, solve and simulate the given circuit to find the nodal voltages V1, V2 and V3. 

5	Maximum Power Transfer theorem- In figure the RLvaries from 0 to 50 k Ω, Write a program and simulate to plot the power dissipated by the load. Verify that the maximum power dissipation by the load occurs when R$L$is 10 kΩ. 
6	Impedance and Admittance- Consider impedance Z for any R-L-C circuit and express it both in rectangular and polar form. Also compute Admittance Y.
7	RL ac circuit- For an series R-L circuit, the voltage $v(t)$ and current $i(t)$ are given as; $v(t) = 10\cos(377t)$ $i(t) = 5\cos(377t + 60^0)$ Simulate the above condition and plot a sketch of $v(t)$ and $i(t)$ for t = 0 to 20 milli seconds.
8	RC circuit- For the figure shown, the input voltage is a rectangular pulse with an amplitude of 5 Volts and a width of 0.5 sec. C = 10 μF and R = 1000 kΩ. Write a program and simulate to plotthe output voltage V0(t) from zero seconds and end at 1.5 seconds. 
9	Half Wave Rectifier- A half-wave rectifier circuit is shown in figure. It consistsofanalternatingcurrent(ac)source,adiodeandaresistor.Write a program and simulate to obtain the input and output plots. Assume suitable values for the acsource and time frame. 

10	Zener Voltage Regulator- A zener voltage regulator circuit of figure has the following data:  Write a program to obtain the Breakdown characteristics and calculate the output voltage Vs = 30 Volts and Vs = 35 Volts.
11	OPAMP Differentiator- For the figure given assume suitable values for Input voltage and circuit components. Write a program and simulate to show a plot for OPAMP differentiator operation. 
12	Number System- Write a program and obtain code conversion for the following.a) $(99)_{10} = (?)_2$ b). $(10011100)_2 = (?)_{10}$ c). $(6F9)_{16} = (?)_2$ and $(?)_{10}$
13	Logic gates- Write a program/ script file that produces a truth tables for the NOT, AND, OR,NAND, NOR, and EXOR operations. Take a and b inputs as 4 bits.
14	De-Morgan's Theorems- Write a program/ M-file to obtain the Truth Table to Prove De-Morgan's Theorems.
15	Seven segment Display- Write a program to solve the 7 Boolean expressions of Seven segment display to get the results in table form to indicate 'Display digit and segment LEDs on'.  [To display the digit with 7 LEDs (light emitting diode) arranged as shown in Fig, the input D should be converted to 4-bit digit code and assigned to 7 Boolean functions to determine the onor off state of each diode in the 7- segment LED display]

16	Transformers- Write a program to compute voltages of primary and secondary, primary current and secondary current. The inputs are kVA = 100, E1 = 230 kV, transformation ratio K = 0.6. Missing data may be assumed suitably. $30 \le V_S \le 35\text{V};\quad R_L = 10\text{K},\quad R_S = 2\text{K}$
17	DC Generators- Write a program to compute Emf generated in dc shunt generator with the given parameters like I_a= 10 A, I_L = 9 A, R_a = 0.5 Ω, Rsh= 120 Ω, and R_L= 6 Ω. Missing data may be assumed suitably.
18	To develop a computer program to form the bus admittance matrix, Y bus of a given power system.

Reference Books:

For Programming:

1. Getting started with MATLAB by RudraPratap, Oxford University Press,2005.
2. MATLAB and its Applications in Engineering by Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813,2009.
3. SCILAB(a Free Software to Matlab),Er. Hema Ramachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011.

For Electrical Engg. Basics:

1. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson EducationIndia, 2012 Edition.
2. A Text Book of Practicals in Electrical Engineering by Dr. N. K. Jain, DhanpatRai Publishing Company,2009.

For Electronics Engg. Basics:

1. Electronics Laboratory Primer by S. Poornachandra and B. Sasikala, S. ChandPublishers and Co,2010.
2. Laboratory Experiments and PSPICE Simulations in Analog Electronics by L.K.Maheshwari and M.M.S.Anand Publishers – PHI Learning Pvt.Ltd.
3. *Digital Electronics*: Principles and Applications by R. L. Tokheim, Tata McGraw- HillEducation,2013.

Freely Available e-Resources/e-Books:

1. http://in.mathworks.com/
2. https://www.scilab.org/resources/documentation/tutorials
3. Introduction to Programming with Matlab by J. Michael Fitzpatrick and John D. Crocetti, Department of Electrical Engineering and Computer Science, School of Engineering, Vanderbilt University, Nashville, TN,2000-2011.
4. Introduction to Matlab: Application to Electrical Engineering by HoussemRafik El Hana Bouchekara, Umm El Qura University, Februray2011.
5. A Matlab Tutorial by Dr. L. Doyle and Dr. A. Kokaram, Department of Electronic and Electrical Engineering, University of Dublin Trinity College,2000.
6. Electronics and circuit analysis using MATLAB by John. O. Attia, Department of Electrical Engineering, Prairie View A&M University, Boca Raton London, New York, Washington D.C., CRC Press,1999.
7. MATLAB for Electrical and Computer Engineering, Students and Professionals *with* Simulinkby Roland Priemer, University of Illinois at Chicago, Scitechpub.com, Edison, NJ,2013.

Program / Semester: **B.Tech (VI)**	Branch: **Humanities**
Subject: **Technical Communication & Soft Skills**	Course Code: **BT03601**
Total Marks (Internal Assessment): 10	L: 0 T:0 P: 2
Internal Assessments to be conducted: 02	Duration (End Semester Exam): **NA**

Minimum Marks: 12

UNIT-1

Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication&writing CVs, Cover Letters for correspondence.Common errors during communication, Humour in Communication.

UNIT-2

Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3

Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Makingbest out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4

Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying “Please”, How to say “NO”.

UNIT-5

Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others**,** controlling anger**,** Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-HillEducation, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success.Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams,and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman& Molly Hamaker. The Hard Truth about Soft Skills. London: HarperCollins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three “As” of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

Branch: Electrical Engineering **Semester: VI**

Subject: Fiber Optics (Professional Elective-II) **Code: BT03604(1)**

Periods per week (L-T-P):(3-1-0) **Number of class Test to be conducted: 2 (Minimum)**

No. of assignment to be submitted: 2 **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20] **Minimum Marks: 25**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

CourseCode	CO Statement	owledgeLevel
1	Illustrate the components materials used for preparation of optical fibre.	2
2	Analyze various characteristics of a signal or a system	4
3	Analyze a given optical fibre with different characteristics.	4
4	Design an economical Optical fibre for communicationsystem.	5
5	Explain Optical fibre for various communication system.	2

UNIT I

Introduction to optical communication, principle of light transmission, optical fiber modes and configuration, mode theory for circular wave guides, single mode fibers, multimode fibers, numerical aperture, mode field diameter, fiber material, fiber fabrication techniques.

UNIT II

Optical sources, LEDs, LASER diodes, Modal reflection noise, Power launching and coupling, Population inversion, Fiber splicing, Optical connectors, Photo detectors, PIN, Avalanche detectors, Response time, Avalanche multiplication noise.

UNIT III

Signal degradation in optical fibers, attenuation losses, Signal distortion in optical wave guides, material dispersion, Wave guide dispersion, Chromatic dispersion, Intermodal distortion, Pulse broadening in graded index fiber, mode coupling, fiber design.

UNIT IV

Coherent optical fiber communication, Modulation techniques for homodyne and heterodyne systems, Optical fiber link design, Rise time budget and link power budget, Long haul systems, Bit error rate, Line coding, NRZ,RZ, Block codes, Eye pattern.

UNIT V

Advanced system techniques, Wavelength division multiplexing, Optical amplification, Semiconductoramplifier, EDFA comparison between semiconductor and optical amplifier, Gain bandwidth,Photonic switching ,Optical networks ,Optical fiberbus, Ring topology, Star architecture, FDDI and SONET standards.

Text Books:

1. Optical Fiber Communication, Gerd Keiser, Mc Graw Hill InternationalEd
2. Optical Fiber Communication, A.K. Ghatak&K.Tyagarajan.
3. OpticalFibre Communication: Principals and Techniques", John M. Senior, PHI NewDelhi

Reference Books:

1. Fibre Optics: Principles and Applications, N.S. Kapany, Academic Press, NewYork.
2. FibreOptics System Network Applications, Terry Edwards, John Wiley &Sons
3. Fibre Optics Test & Measurements, Dennis Drickson, Prentice Hall PTR, NJUSA.

4. Fibre Optic Communication Technology, D. Jafar, K. Mynbaev& Lowell L. Schenier, Pearson Education, Asia.it'sApplications, S.C. Gupta, PHIIndia

Branch: Electrical Engineering **Semester: VI**

Subject: Microcontroller and Embedded System(Professional Elective-II) **Code: BT03604(2)**

Periods per week (L-T-P):(2-1-0) **Number of class Test to be conducted: 2 (Minimum)**

No. of assignment to be submitted: 02(Minimum) **Scheme of Examination (Theory):**

Total Marks-100 [ESE-70, CT-10, TA-20]

Minimum Marks: 25

COURSE OUTCOMES: After successful completion of this course, the student will able to:

Course Code	CO Statement	Knowledg e
1	Compare elements of Microcontroller family, and understand pinconfiguration of 8051	2
2	Interpret the architecture, various instructions and their application in programming of microcontroller 8051	2
3	Apply the knowledge of counters and interrupts to make programs for external interrupts	3
4	Illustrate different Protocols of serial communication in microcontroller8051	2
5	Explain different categories, requirements and applications of embedded system	2

UNIT I

Introduction to Microcontroller: A brief History of Microcontrollers, Harvard Vs Von- Neumann Architecture, RISC Vs CISC, Classification of MCS-51family based on their features (8051, 8052, 8031, 8751, AT89C51), Pin configuration of 8051

UNIT II

8051 Processor Architecture and Instruction Set: Internal block diagram, Registers of8051, Inbuilt RAM, Register banks, stack, on-chip and external program code memory ROM, power reset and clocking circuits, I/O port structure, Addressing modes, Instruction set and simple programming

UNIT III

Counter/Timer and Interrupts of 8051: Introduction, Registers of timer/counter, Different modes of timer/counter, Timer/counter programming, Interrupt Vs Polling, Types of interrupts and vector addresses, register used for interrupts initialization, programming of external interrupts, Timer interrupts.

UNIT IV

Asynchronous Serial Communication: Introduction to serial communication, Types,RS232 standard, RS422 Standard, 1488 and 1489 standard, GPIB, Max 232/233Driver

UNIT V

Overview of Embedded System: Embedded System, Categories of Embedded System,Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices.

Name of Text Books:

1. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi& McKinlay,2nd Ed.,PHI.
2. The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Name of Reference Books:

1. Microcontrollers: Architecture, Programming, Interfacing and System Design, Rajkamal, Pearson Education
2. Programming for Embedded Systems- Dreamtech Software Team, Wiley Dreamtech
3. Programming and Customizing the 8051 Microcontroller, Predko; TMH

Branch: Electrical Engineering **Semester: VI Subject: Hybrid Electric Vehicles (Professional Elective-II)** **Code: BT03604(3)**

Periods per week (L-T-P) :(2-1-0) **Number of class Test to be conducted: 2 (Minimum)** **No. of assignment to be submitted: 05**

Scheme of Examination (Theory):

Total Marks-100[ESE-70, CT-10, TA-20] **Minimum Marks: 25**

COURSE OUTCOMES: After successful completion of this course, the student will able to:

CO	Statement	KnowledgeLevel
CO-1	ose a suitable drive scheme for developing an electric hybrid vehicle depending on resources	1
CO-2	strate andexplain basic schemes of electric vehicles and hybridelectric vehicles.	2
CO-3	Choose proper energy storage systems for vehicle applications	3
CO-4	ssify various communication protocols and technologies used in vehicle networks.	4
CO-5	Interpretation of different energy storage system.	5

UNIT-I

Introduction to Hybrid Electric Vehicles:

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics.

UNIT-II :

Electric and Hybrid traction:

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis .

UNIT-III

Electric Drive-trains:

Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control

in electric drive-train topologies, fuel efficiency analysis .

UNIT-IV:

Electric Propulsion System

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives

UNIT-V:

Energy Storage and Sizing the drive system:

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics.

Text Books :

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

Reference Books :

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and FuelCell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Branch: Electrical Engineering **Semester: VI**

Subject: Digital Control Systems (Professional Elective - II) **Code: BT03604(4)**

Periods per week (L-T-P):(2-1-0) **Number of class Test to be conducted: 2 (Minimum)** **No. of assignment to be submitted: 02**

Scheme of Examination (Theory): Total Marks-100 [ESE-70, CT-10, TA-20]

Minimum Marks: 25

COURSE OUTCOMES: After successful completion of this course, the student will able to:

CourseCode	CO Statement	owledgeLevel
1	Apply z transform to convert analog filter into digital filter.	3
2	Analyze the performance of filters.	3
3	Apply sampling techniques used in the communication.	3
4	Design digital filters and control their performance.	6
5	the optimization problem in control system	2

Unit 1

Z transform: Z transform, Relationship between the s-plane and the z-plane, Inverse z- transform, Properties of Z transform, applications of z-transform, Delayed z-transform, Modified z- transform, Design of digital control systems using Z transform, Characteristic equation of closed loop systems

Unit 2

State-space analysis: Analysis of sampled data systems, State equations of discrete data systems, Eigen values, Eigenvectors, State transition matrix, State diagram of discrete-data systems with zero order hold; Controllability, Observability.

Unit 3

Sampling Techniques: Sampling: Types of sampling, instantaneous sampling, natural sampling, flat top sampling, Sample and hold circuits, Reconstruction of signals, Sampling rate, Nyquist criteria for sampling, Aperture effect, Applications.

Unit 4

Control System Design: Design using state-space techniques, Stability tests using Bilinear transformation, Jury's stability test, Second method of Lyapunov, Root loci for digital control systems, design of discrete PID, PD and PI controllers, Effect of adding poles and zeros, Pole placement design techniques.

Unit 5

Optimum control system: Parametric optimization problem using second method of Lyapunov, Quardric optimal control problem, Performance indices, Linear Quadratic Regulator design.

Text Books:

1. D. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition, 2007.
2. K. Ogota, Discrete Time Control Systems, Prentice Hall, 2/e, 1995.
3. Madan Gopal, Digital Control and State Variable Methods.

Reference Books:

1. "Modern control engineering", Roy Choudhary, PHI.
2. "Control System Analysis and Design",K K Agarwal.
3. "Control Engineering Theory and Practice",M N Bandhopadhyay, PHI.
4. "Introduction to Control Engg. Model, Analysis and Design", Ajit K Mandal, New Age International Publishers.
5. I J Nagrath and M Gopal; New Age international Publishers, Forth Edition