GIRIJANANDACHOWDHURYUNIVERSITY

Hathkhowapara, Azara, Guwahati781017,Assam

School of Engineering & Technology

B.Tech. – Computer Science and Engineering

Semester II

Theory/ Practical	Sl. No	Course Code	Course Name	Hours per week			Credit
				L	T	P	C
T	1.	BPY23111T	Physics	3	1	0	4
P	2.	BPY23111P	Physics Laboratory	0	0	2	1
T	3.	BMA23111T	Mathematics – II	3	1	0	4
T	4.	BBI23101T	Biology for Engineers	2	0	0	2
T	5.	BEL23101T	Basic Electrical Engineering	3	1	0	4
P	6.	BEL23101P	Basic Electrical Engineering Laboratory	0	0	2	1
P	7.	BCE23101P	Engineering Graphics and Design	1	0	4	3
P	8	BCS23102P	Programming using C++	1	0	2	2
P	9	BME23101P	Design Thinking and Idea Lab Workshop	0	0	2	1
				13	3	12	22

BSC	PHYSICS	L	T	P	C
		3	1	0	4

Prerequisite: Physics and Mathematics course of 12th standard.

Course Objectives:

1. To enhance the fundamental knowledge in mathematics to understand engineering courses.
2. To have a broader concept of electrostatics related to dilectrics.
3. To be aware of magnetic behavior of different substances by understanding basics of magnetism and electromagnetic theory.
4. To enhance the knowledge of wave propagation to be applied in engineering fields.
5. To have a wider perspective of wave theory.

Course Outcome: After successful completion of the course, the students will be able

CO1: understand the concept of fundamental of mathematical physics and apply in solving problems.
CO 2: to apply the mathematical physics to study the dielectric properties of matter.
CO 3: understand the basics of electromagnetism by applying magnetostatics and electrostatics theory.
CO 4: to understand the concept of transverse and longitudinal wave propagation.
CO 5: to understand the geometrical optics, wave optics and lasers.

Module 1: Mathematical Physics	**12 hours**

Del operator, Laplacian operrtor gradient, divergenge and curl, problems related to these concepts, their physical significance (qualitative), Gauss's theorem, Stoke's Theorem

Module 2: Electrostatics in vacuum and other dielectric media	**12 hours**

Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the center of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field

Module 3: Magnetostatics and Electromagnetic theory	**12 hours**

Bio-Savart law, Ampere's law, Inconsistency of Amere's law, Displacement current, Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF, magnetic substances, paramagnetic, diamagnetic, ferromagnetic, Maxwell's equations (qualitative)

Module 4: Harmonic motion , Non-dispersive transverse and longitudinal waves	**12 hours**

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, Transverse wave on a string, the wave equation on a string, Harmonic waves, longitudinal waves and the wave equation for them

Module 5: Optics	**12 hours**

Spherical and chromatic aberrations, Achromatism in different cases, interference of light in Newton's rings experiment, Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, , different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium)

Total hours	**60 hours**

Text Book(s)

1. Introduction to Electrodynamics, D.J Griffiths, 3rd Edn., 1998, Benjamin Cummings.
2. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill
3. Education Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
4. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill
5. Ian G. Main, Oscillations and waves in physics.

Reference Books

1. The Feynman Lectures on Physics, Vol I, II,III
2. Bhattacharya & Nag, Engineering Physics
3. O. Svelto, Principles of Lasers

BSC	PHYSICS LABORATORY	L	T	P	C
		0	0	2	1

Pre-requisite: Basics of 12 standard Physics lab

Course Objectives:

1) To develop the laboratory skill in handling equipments.
2) Provide the basic idea of various electromagnet theorems
3) To develop the technical skill & ideas through continuous interactions..
4) To understand the basic concepts for performing different experiment for further application

Course Outcomes:

CO1: Learning basic concept of various measuring instruments
CO2: Learning the basic concept measuring various electrical components by using Digital multimeter
CO3: Understand the concept of focal length and power of lens
CO4: Understand the concept of measuring inductance of coils.
CO5: Learning the concept of resonant and anti-resonant frequency concept of LCR circuit.
CO6: The basic idea focal length, refractive index of a material and diffraction of light.

List of Experiments

1. Measured the length, breadth and diameter of particular shapes by using slide calipers and screw gauge.
2. To measure the
   a) Resistance, Capacitance and Inductance
   b) AC & DC Voltage and current by using Digital Multimeter
3. To determine the inductance of a coil by Anderson's bridge
4. To study a series LCR circuit and determine it's
   a) Resonant frequency and b) Quality factor Q
5. To study a parallel LCR circuit and determine its
   a) Anti-resonant frequency and b) Quality factor Q.
6. Measure the self-inductance of a coil by Rayleig's method.
7. To determination of the power of (a) Convex lens (b) Concave lens
8. To find the radius of curvature of a Plano convex lens using Newton's ring apparatus
9. To find the refractive index of water using a convex lens and a plain mirror.
10. To find the refractive index of the material of the Prism with the help of spectrometer.

Total Hours **15 Hours**

Text Book(s)

1	A text book on Practical Physics: K.G. Mazumdar &B.Ghosh
2	A text book on Practical Physics: Dr. Samir Kumar Ghosh

Reference books

1.	B.Sc. Practical Physics by C.l. Arora.
2.	Bhattacharya & Nag. Engineering Physics.

BSC	MATHEMATICS-II (ODE & Complex Variables)	L	T	P	C
		3	1	0	4

Pre-requisite: Knowledge of Mathematics at Class XI & XII

Course Objectives:

1. To familiarize the prospective engineers with techniques in ordinary differential equations and complex variables
2. To provide the basic tools of mathematics for the purpose of modelling the problems and obtaining solutions.

Course Outcome:

After successful completion of the course, the students will learn

CO 1: the effective mathematical tools for the solutions of differential equations that model physical processes.

CO 2: the tools of differentiation and integration of functions of a complex variable that are used in varioustechniques dealing engineering problems.

Module 1:First Order Ordinary Differential Equations — **15hours**

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

Module 2:Ordinary Differential Equations of Higher Orders — **15 hours**

Second order linear differential equations with variable coefficients: Euler-Cauchy equations, Solution by variation of parameters; Power series solutions: Legendre's equations and Legendre polynomials, Frobenius method, Bessel's equation and Bessel's functions of the first kind and their properties.

Module 3: Complex Variable – Differentiation — **15 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.

Module 4: Complex Variable – Integration — **15 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.

Total Lecture hours — **60 hours**

Text Book

1. AICTE's Prescribed Textbook: Mathematics-II (Calculus, Ordinary Differential Equations and Complex Variable), Khanna Book Publishing Co.

Reference Books

1. ReenaGarg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
2. ReenaGarg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
7. S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984
8. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
9. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958

Total hours — **45 hours**

Text Book

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

BSC	BIOLOGY FOR ENGINEERS	L	T	P	C
		2	0	0	2

Prerequisite: Biology in intermediate level

Course Outcome:

After studying the course, the student will be able to:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level
8. Apply thermodynamic principles to biological systems.
9. Identify and classify microorganisms

Module:1 Introduction — **4 hours**

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module:2 Classification — **3 hours**

The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Module:3 Genetics — **3 hours**

“Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module:4 Biomolecules — **3 hours**

All forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module:5 Enzymes	**3 hours**
Without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyze reactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	
Module: 6 Information Transfer	**3 hours**
The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. DICOM Image formats, The DNA Technology (Use and Application) Regulation Bill, 2019	
Module: 7 Macromolecular Analysis	**3 hours**
How to analyses biological processes at the reductionistic level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	
Module: 8 Metabolism	**4 hours**
The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	
Module: 9 Microbiology	**4 hours**
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.	
Total hours	**30 hours**

Text Book

1.	General Biology, Uma Devi Koduru, Khanna Book Publishing Company.

Reference Books

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

ESC	BASIC ELECTRICAL ENGINEERING	L	T	P	C
		3	1	0	4

Pre-requisite: Physics and Mathematics in intermediate level

Course Objectives:

1. The network reduction techniques such as source transformation, mesh analysis, nodal analysis and network theorems to solve different networks
2. The various configurations of electromagnetic induction used in magnetic circuits
3. The steady state response of complex electrical circuits with single phase AC supply
4. The three phase systems for star and delta connected systems and perform three phase power calculations for balanced and unbalanced loads.
5. The fundamentals of instrumentation in measurements and calibration of instruments.
6. The different parameters for characterizing different circuits like rectifiers, filters, voltage regulators etc. using p-n junction diodes, Zener diodes and BJTs.
7. The different cables, wiring systems, wiring circuits, earthing and its purpose, fuse, MCBs and their role in electrical installations.

Course Outcome: After successful completion of the course, the students will be able

1. Analyze DC networks and theorems using various solution techniques.
2. Apply fundamental concepts of magnetic circuits and AC networks to solve problems.
3. Explain different types of measuring instruments and their workings.
4. Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, BJT, rectifiers and different filter circuits.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Module 1: DC Networks — **10 hours**

Definitions of active, passive, linear non-linear circuit elements and networks; Kirchhoff's laws; Nodal and mesh analysis; Voltage and current sources; Network theorems: Superposition, Thevenin's, Norton's and Maximum power transfer.

Module 2: Magnetic Circuits — **10 hours**

Definitions of mmf, flux, flux-density and reluctance; comparison between electric and magnetic circuits; series, parallel and series-parallel circuits and their solutions; energy stored in a magnetic circuit; lifting power of a magnet; electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 3: AC Circuits — **10 hours**

Waveforms of alternating voltages and currents, instantaneous, average and RMS values, form factor & peak factor, forms of representation of alternating quantities, concept of phasor & phasor diagrams, Concept of lead & lag, reactances & impedances, AC circuits-resistive, inductive, capacitive, RL, RC & RLC series, parallel and series parallel combination, impedance triangle, admittance, active & reactive power & power factor, Concepts of 3-phase AC, connections, phase & line values in star & delta connections, solutions of simple 3-phase balanced circuits with resistive & reactive loads, 3-phase power, and phase sequence

Module 4: Instruments — **10 hours**

Classification of instruments; essentials of indicating type instruments-deflecting controlling and damping torque; types of indicating instruments; moving coil and moving iron ammeters and voltmeters; extension of range of instruments -use of shunts and multiplier

Module 5: Electronics — **10 hours**

Diode as a rectifier-half wave and full wave rectifier circuits; ripples in output waveform-ripple factor; introduction to filters; Zener diode and its application as voltage regulator; bipolar junction transistor and its classification, static characteristics.	
Module 6: Basics of Electrical Installations	**10 hours**
Basic knowledge of domestic wiring, types of cables, types of wiring; circuit layouts-single phase AC mains to DB; 3 phase connections; accessories-main switch,	

ceiling rose, fuse, MCB etc., Earthing-purpose & methods.	
Total hours	**60 hours**
Text Book(s)	
1.	Basic Electrical Engineering: I J Nagrath and DP Kothari, McGraw Hill Education Pvt Ltd.
2.	Basic Electrical Engineering: Mittle and Mittle, McGraw Hill Education (India) Pvt Ltd.
3.	Electro Technology: H Cotton, CBS Publishing.
4.	Electrical and Electronic Technology-Edward Hughes, Pearson Education India.
Reference Book(s)	
1.	Basic Electrical Engineering: Ravish R Singh, McGraw Hill Education (India) Pvt Ltd.
2.	Basic Electrical Engineering: K. Uma Rao, Pearson Education India.
3.	Basic Electrical and Electronics Engineering: R.K. Rajput, University Science Press.
4.	Basic Electrical and Electronics Engineering: J.B. Gupta, S.K. Kataria and Sons

ESC	BASIC ELECTRICAL ENGINEERINGLABORATORY	L	T	P	C
		0	0	2	1

Prerequisite: Physics and Mathematics in intermediate level

Course Objectives:

The students will try to learn

1. Implement different circuits and verify circuit concepts for DC and AC circuits.
2. Measure the parameters for RL, RC and RLC circuits.
3. Prove the various theorems used to reduce the complexity of electrical network.

Course Outcome:

After successful completion of the course, the students will be able learn

CO1: Practical implementation of Electrical fundamentals.

CO2: To demonstrate measurement and calibration using electrical instruments.

CO3: To implement various electrical theorems and study parameters ofelectrical and electronic circuits.

List of Experiments

1. Basic safety precautions, introduction and use of measuring instruments.
2. Calibration of a Milliammeter as a Voltmeter
3. Calibration of a Millivoltmeter as an Ammeter
4. Verification of Thevenins Theorem
5. Verification of Maximum Power Transfer Theorem
6. Study of R-L-C Series Circuit
7. Forward Characteristics of Semiconductor Diode
8. Measurement of power in a single phase AC circuit using Wattmeter.
9. Demonstration of layout of house wiring
10. Demonstration of measurement of insulation resistance

List of Equipments

1. AC, DC Voltmeter
2. AC, DC Ammeter
3. Wattmeter meter
4. Rheostat
5. DC supply

Total Hours: 15

Text Book

1	Basic Electrical Engineering: I J Nagrath and DP Kothari, McGraw Hill Education Pvt Ltd.
2	Basic Electrical Engineering: Mittle and Mittle, McGraw Hill Education (India) Pvt Ltd.
3	Electrical and Electronic Technology-Edward Hughes, Pearson Education India.

Reference Books

1.	Basic Electrical Engineering manual; available at the department of Electrical Engineering, GCU

ESC	ENGINEERING GRAPHICS AND DESIGN	L	T	P	C
		1	0	4	3

Prerequisite: Basic Mathematics

Course Objectives:

1. To provide the basic knowledge about Engineering Drawing.
2. Detailed concepts are given in projections, technical drawing, dimensioning and specifications

Course Outcome:

Upon completion of this course, the student will be able to

1. To prepare themselves to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
2. To prepare themselves to communicate effectively
3. To prepare themselves to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Module:1 Introduction to Engineering Drawing — **9 hours**

i. Principles of Engineering Graphics and their significance, usage of Drawing instruments
ii. Lettering - Single stroke letter – Vertical and inclined capital and small letter
iii. Scales – Plain, Diagonal and Vernier Scales
iv. Curves - Ellipse, parabola, hyperbola, different methods of construction of conic sections, tangents and normal to conics

Module:2 Orthographic Projections — **9 hours**

i. Principles of Orthographic Projections-Conventions
ii. Projections of Points and lines inclined to bothplanes
iii. Projection of lines (First angle only) : Line parallel to one or both planes, line perpendicular to a plane, line inclined to one plane and parallel to other, line inclined to both plane.
iv. Projections of planes (First angle only): Plane perpendicular to one plane and parallel to other, plane perpendicular to both plane, plane inclined to one plane and perpendicular to other.
v. Projection of solids (First angle only) : Axis perpendicular to one plane and parallel to other, axis parallel to both plane, axis inclined to one plane and parallel to other, axis inclined to both plane.

Module:3 Sections and Sectional Views of Right Angular Solids — **9 hours**

Section of solids: Section plane parallel to one plane and perpendicular to other, section plane inclined to one plane and perpendicular to other. Development of surfaces of Right Regular Solids- Prism, Pyramid, Cylinder and Cone

Module:4 Isometric Projections — **9 hours**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module:5 Introduction of Computer Graphics — **6 hours**

Listing the computer technologies that impact on graphical communication, Demonstratingknowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, ObjectProperties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, CoordinateSystem), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (whereapplicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.;Isometric Views of lines, Planes, Simple and compound Solids]

Module:6 Demonstration of simple team design (Students Project as group work) — **3 hours**

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; mesh edtopologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

Total hours — **45 hours**

Text Book

1. AICTE's Prescribed Textbook: Engineering Graphics & Design (ISBN: 978-93-91505-066)

Reference Books	
1.	Jain, Maheshwari, Gautam (2021), Engineering Graphics & Design, Khanna Book Publishing.
2.	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing.
3.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson.
4.	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
5.	Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6.	Corresponding set of CAD Software Theory and User Manuals

PCC	PROGRAMMING USING C++	L	T	P	C
		1	0	2	2

Prerequisite: Mathematics-1, Programming for Problem Solving

Course Objectives: The objectives of this course are to:

1. To learn the fundamentals of C++ programming.
2. To learn the syntax and semantics of C++ programming language.
3. To obtain approximate solutions to common numerical methods.
4. To derive numerical methods for various mathematical operations and tasks.
5. To derive numerical methods for solutions of non-linear, algebraic and ordinary differential equations.
6. To analyze and evaluate the accuracy of common numerical methods.
7.

Course Outcome: After successful completion of this course, the students will be able to

- CO1: Describe the C++ concepts of streams, classes, functions, data and objects.
- CO2: Implement the use of OOPs concepts using C++ programs.
- CO3:Build programs for numerical solution of non-linear and algebraic equations.
- CO4: Build programs for numerical solution of ordinary differential equations.

Module 1: Introduction to C++	**6 hours**

Basic concepts of OOPs, structure of C++ program, tokens (identifiers, keywords, constants, operators, special characters), data types (basic, derived, user defined), console I/O statements

Module 2: C++ Programming	**8 hours**

Defining a class, creating objects, accessing data members using objects, calling member functions using objects, scope resolution operator, access specifiers (private, public, protected)

Module 3: Numerical solution of non-linear and algebraic equations	**8 hours**

Method of successive bisection, Regula-Falsi& Newton-Raphson method, Gauss-elimination method, Gauss-Seidel method

Module 4: Numerical Solution of Ordinary Differential Systems	**8 hours**

Euler's method, Runge-Kutta – 4th order method, predictor-corrector method, two ordinary differential equation using numerical integration, Trapezoidal Rule of Numerical integration, elliptic boundary value problem using method of finite differences.

Total hours	**30 hours**

Text Book(s)

1.	Object Oriented Programming using C++by E. Balaguruswamy
2.	Object Oriented Programming and C++ by Rajaraman, New Age International.
3.	Numerical method: E. Balaguruswamy T.M.H
4.	Numerical Methods, Sukhendu Dey, Shishir Gupta, McGraw Hill Education (India) private Limited
5.	Numerical & Statistical Methods With Programming in c by Sujatha Sinha

Reference Books

1.	Herbert Schildt, C++ The Complete Reference, Fourth Edition, Tata McGraw HillPublication.
2.	Joyce Farrell, Object-oriented programming using C++, Fourth Edition, Cengage Learning.
3.	Numerical Methods by B.S. Grewal

4.	Computer Programming & Numerical Analysis by N Dutta, University Press
5.	Numerical Algorithms. E. V. Krishnamurthy, S. K. Sen. Affilated East-West Press

BME23103P	Design Thinking and IDEA Lab	L	T	P	C
		0	0	2	1

Pre-requisite: Mathematics-1, Physics-1, Engineering Graphics & Design

Course Objectives: The objectives of this course are to:

8. Learn all the skills associated with the tools and inventory associated with the IDEA Lab.
9. Learn useful mechanical and electronic fabrication processes.
10. Learn necessary skills to build useful and standalone system/ project with enclosures.
11. Learn necessary skills to create print and electronic documentation for the system/project.

Course Outcome: After successful completion of this course, the students should be able to:

1. Think outside the box and generate new and innovative ideas.
2. Identify and solve problems using critical thinking skills and creative problem-solving techniques.
3. Work collaboratively in a team, motivate others and understand the importance of effective communication, cooperation and conflict resolution to achieve a common goal.
4. Use various technologies and tools to develop, implement and explore new plans testing their ideas.

Module 1: Introduction to Tools	**2 hours**

Introduction to basic hand tools - Tape measure, Vernier caliper, Hammers, Fasteners, Wrenches, Pliers, Saws, Tube cutter, Chisels, Vice and Clamps, Tapping and Threading, Adhesives. Introduction to Power tools - Power saws, Jigsaw, Angle grinder, Belt sander, Bench grinder, Rotary tools, Various types of drill bits.

Module 2: Mechanical Cutting/Joining Process	**10 hours**

Mechanical cutting processes - Basic operation in Lathe, Milling, Drilling, Grinding, Carpentry, Black Smithy operations, Wood Lathe, Basic welding, brazing and other joining techniques for assembly.

Module 3: Additive & Subtractive Manufacturing	**10 hours**

3D printing and prototyping technology, 3D printing using FDM, SLS and SLA, Basics of 3D scanning, point cloud data generation for reverse engineering, Prototyping using subtractive cutting processes. 2D and 3D Structures for prototype building using Laser cutter and CNC routers.

Module 4: PCB Design and Fabrication	**10 hours**

Familiarization to basic electronic components, Schematic design and board layout using Eagle software. Entire PCB fabrication process (printing, heat transfer, etching, drilling, component pasting, soldering, testing & verification).

Total Lecture hours	**hours**

Text Book(s)

1. Chapman W.A.J, "Workshop Technology", Volume I, II, III, CBS Publishers and distributors, 5th Edition,2002.

2.	3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
3.	Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing," Springer, 2010
4.	Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer, 2004.
5.	All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book Publishing Company, New Delhi.
6.	The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
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