SCHEME OF INSTRUCTION

B.E. (Biomedical Engineering)

II - SEMESTER

With effect from the Academic year 2018-2019

S. No	Course Code	Course Title	Scheme of Examination		L	T	P	Hrs/ Wk	Credits
			CIE	SEE					
1.	MT 201 BS	Engineering Mathematics- II	30	70	3	1	0	4	4
2.	PH 201 BS	Applied Physics	30	70	3	1	0	4	4
3.	CS 201 ES	Programming For Problem Solving	30	70	3	0	0	3	3
PRACTICALS									
4.	PH 251 BS	Applied Physics Lab	25	50	0	0	3	3	1.5
5.	CE 151 ES	Engineering Graphics	50	50	0	0	6	6	3
6.	CS 251 ES	Programming for Problem Solving Lab	25	50	0	0	3	3	1.5
7.	EE 151 ES	Basic Electrical Engineering Lab	25	50	0	0	2	2	1
8.	ME 151 ES	Workshop Practice	25	50	0	0	6	6	3
Total			**215**	**460**	**9**	**2**	**20**	**31**	**21**

With effect from the academic year 2018-2019

MT 201 BS

ENGINEERING MATHEMATICS – II

(Common to all branches)

Instruction	(3L+1T) Periods per week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

- To study matrix algebra and its use in solving system of linear equations and in solving eigen value problems
- To provide an overview of ordinary differential equations
- To study special functions like Legendre and Bessel functions
- To introduce the concept of functions of complex variable and their properties

Course Outcomes: After completion of course, the students will be able to

1. Solve system of linear equations and eigenvalue problems
2. Solve certain first order and higher order differential equations
3. Determine the analyticity of complex functions and expand functions as Taylor and Laurent series
4. Evaluate complex and real integrals using residue theorem

UNIT-I

Matrices : Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, eigen values, Eigenvectors, Properties of eigen values, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation , Nature of quadratic forms.

UNIT-II

First Order Ordinary Differential Equations : Exact first order differential equations , Integrating factors, Linear first order equations , Bernoulli's , Riccati's and Clairaut's differential equations ,Orthogonal trajectories of a given family of curves.

UNIT-III

Differential Equations of Higher Orders : Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients , Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation, Simultaneous linear differential equations, Power Series solution, Legendre Polynomial of first kind, Bessel's function of first kind and their properties

UNIT-IV

Functions of a Complex Variable:Limits and continuity of a function, differentiability and analyticity, Elementary Analytic functions, Necessary and Sufficient conditions for a function to be analytic,Cauchy-Riemann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula,Cauchy's inequality, Cauchy's formula for derivatives, Liouville's theorem, Maximum Modulus principle (without proof)and its applications.

UNIT-V

Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, Argument principle, Rouche's Theorem and their applications, conformal mapping Bilinear transformations. (**All Theorems without Proof).**

Suggested Readings:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics,* Narosa Publications, 4th Edition,2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley , 9th Edition, ,2012.
3. Dr.B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition,2014.
4. Dr.M.D.Raisinghania, *Ordinary and Partial differential equations*, S.CHAND, 17th Edition 2014.
5. James Brown, R.V Churchill, *Complex Variables and applications*, Mc GrawHill 9th Edition 2013.
6. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
7. S.L Ross, *Differential Equations* 3rd Edition, Wiley India.
8. G.F. Simmons and S.G. Krantz, *Differential Equations*, Tata Mc Graw Hill, 2007.
9. N. Bali, M.Goyal, A text book of *Engineering Mathematics*,Laxmi publications,2010
10. H.K. Dass, Er. Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition.

PH 201 BS

APPLIED PHYSICS

Instruction	(3L+1T) Periods per week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

- To make student understand the basic concepts of wave mechanics and to know the significance of Maxwell's equations in engineering applications.
- To state the principle of optical fiber and to understand the design and applications of optical fiber
- To explain the principles of laser and to demonstrate the applications of laser.
- To understand the concept of ultrasonics and its wide applications.
- To study different types of dielectric polarizations and dielectric properties of materials. To understand the concept of semiconductors and its wide applications.
- To make student understand the basic concepts of superconductivity. To know the significance of magnetic materials in normal life.
- To study the preparation of thin films and their importance. To understand the basic concepts of nanomaterials

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

1. Solve engineering problems using the concepts of wave and particle nature of radiant energy. Explain the significance of electromagnetic waves.
2. Compile the applications of laser and fiber optics in the field of industry, medical and telecommunication.
3. Show their understanding about the conductivity nature of semiconductors and its wide applications. Demonstrate the knowledge in dielectric materials applications and its importance.
4. Apply the basic concepts of superconductivity and magnetic materials in engineering applications.
5. Understand the widely used current technologies such as solar cells, fire alarms etc., which are based on thin films. Explain about the importance of nanomaterials.

UNIT-I

Wave mechanics: Matter waves–de-Broglie wavelength, properties of wave function,Physical significance - Schrödinger time dependent and time in-dependent wave equation.Particle in a 1-D box.

Electromagnetic theory: Basic laws of electricity and magnetism - Maxwell's equations in integral and differential forms - Conduction and displacement current – Relation between D, E and P - Electromagnetic waves: Equation of plane wave in free space – Poynting theorem.

UNIT-II

Fibre Optics: Introduction – Propagation of light through an optical fiber - Acceptance angle,Numerical aperture (NA)– Types of optical fibers and refractive index profiles – Fibre drawing process (double crucible method)- Application of optical fibers

Lasers: Characteristics of lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon laser – Semiconductor laser – Applications of lasers.

***Ultrasonics*:** Introduction to Ultrasonic waves – Production of ultrasonic waves by Piezoelectric method – Detection of ultrasonic waves : Piezoelectric detector – Properties of Ultrasonics – Wavelength of Ultrasonics by Debye-Sears method – Applications.

UNIT-III

Semiconductors: Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode and its I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

Dielectric Materials: Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium titanate - Applications of Ferroelectrics

UNIT-IV

Superconductivity: Introduction - General properties of super conductors - Meissner effect,Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High Tc superconductors - Applications of superconductors.

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials – Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials – Ferrites: Applications of ferrites.

UNIT-V

Thin films: Distinction between bulk and thin films - Thin film preparation techniques: Thermal evaporation methods, Electron beam evaporation – Construction and working of Solar cell – Applications.

Nanomaterials*:* Introduction - Properties of materials at reduced size - Surface to volume ratio at nano scale – Classification of nanomaterials - Preparation of nanomaterials: bottom– up methods (sol gel and CVD), Top-down methods (ball milling) - Basic ideas of carbon nanotubes – Applications nanomaterials and their health hazards.

Suggested Readings:

1. B.K. Pandey and S. chaturvedi, *Engineering Physics*. Cengage Learning 2012
2. C. Kittel - *Introduction to Solid State Physics*, Wiley Eastern Ltd. 5th Edition, 1976
3. S.L. Gupta and V. Kumar - *Solid State Physics*, K.Nath & CO., 8th Edition, 1992.
4. A. Goswami - *Thin Film Fundamentals*, New Age International, 2007.
5. A.K Bhandhopadhya - *Nano Materials*, New Age International, Ist Edition,2007.
6. M.S. Avdhanulu and P.G. Kshirasagar - *Engg. Physics*, S.Chand & Co., Ist Edition, 1992.
7. C.M. Srivastava and C. Srinivasan - *Science of Engg. Materials*, New Age International, 2002.

With effect from the academic year 2018-2019

CS 201 ES

PROGRAMMING AND PROBLEM SOLVING

Instruction	(3L) Periods per week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

- To introduce the basic concepts of Computing environment, number systems and flowcharts
- To familiarize the basic constructs of C language – data types , operators and expressions
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types and memory management using pointers To learn the concepts of data handling using files

Course Outcomes: The students will able to

1. Explain various functional components in computing environment
2. Develop algorithmic solutions to problems and draw the flow charts
3. Explain and use basic constructs of C in writing simple program
4. Use standard library functions in C and develop modular programs using user defined functions and structured data types

UNIT-I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. **Number Systems**: Binary, Octal, Decimal, Hexadecimal.

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions.. **Storage Classes:** Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers

UNIT-III

Preprocessors: Preprocessor Commands

Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications,

Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT-IV

Pointers - Introduction, Pointers for Inter- Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT-V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Readings:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C"* , Cengage Learning, 2007
2. Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4. Dromey *How to solve it by Computer*, Pearson Education, 2006

PH 251 BS

APPLIED PHYSICS LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

- Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
- Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
- Demonstrate the ability to prepare a valid laboratory notebook.
- Demonstrate the ability to understand the construction and working of different experiments

Course Outcomes:

1. Student recognize the correct number of significant figures in a measurement or in the results of a computation.
2. Students can use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
3. Students will keep a lab notebook that documents their experience in each lab procedure.
4. Develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.

Experiments:

1. To calculate the Numerical aperture (NA), acceptance angle of a given optical fibre.
2. Determination of wavelength of LASER using diffraction grating.
3. Determination of Velocity of ultrasonic waves in a liquid by Debye-Sears method.
4. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
6. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
7. To draw the I-V Characteristics of a solar cell and to calculate the i) Fill factor ii) Efficiency and iii) Series resistance.
8. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
9. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
10. To determine the constants of A, B and α using Thermistor characteristics.

CE 151 ES

ENGINEERING GRAPHICS

Instruction	6 Periods per week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Course Objectives:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling

Course Outcomes: The students will be

1. Able to create working drawings
2. Able to communicate through drawings
3. Ability to create standard solid sections by drawing

UNIT – I

Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

UNIT – II

Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper usin the print command.

UNIT – III

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT – IV

Scales – Reduced and Enlarged scales, representative fraction, Plain, Diagonal and Vernier Scales, Projections of Points – placed in different quadrants, Projection of straight lines parallel to one plane, perpendicular to one plane, inclined to one plane and lines inclined to both planes.

UNIT – V

Projections of planes, inclined Planes - Auxiliary Planes, Projections of Regular Solids covering, those inclined to both the Planes.

Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
5. (Corresponding set of) CAD Software Theory and User Manuals
6. S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., Pratap Gunj, Delhi.

With effect from the academic year 2018-2019

CS 251 ES

PROGRAMMING AND PROBLEM SOLVING LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives:

- To use tools available under LINUX for C programming
- To gain hands-on experience on basic constructs of C programming To formulate problems and implement algorithmic solutions in C
- To write modular programs in C using structure programming techniques and data files.

Course Outcomes: The students will be able to

1. Write, compile and debug C programs in Linux environment
2. Write simple programs using control structures, user defined functions and data manipulation using arrays
3. Use standard C library functions to develop modular programs in C

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc

14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node,reverseing list.

For online practice problems : https://projecteuler.net

EE 151 ES

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Periods per week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Course Outcomes: The students will able to

1. Get an exposure to common electrical components and their ratings. Make electrical connections by wires of appropriate ratings.
2. Understand the usage of common electrical measuring instruments.
3. Understand the basic characteristics of transformers and electrical machines. Get an exposure to the working of power electronic converters.

Suggested List of Laboratory Experiments/Demonstrations:

I - Cycle

Demonstration 1. Basic safety and precautions - Introduction and use of measuring instruments

Exp 1. Verification of Kirchhoff's Laws

Exp 2. Verification of Thevenin's & Norton's Theorem

Exp 3. Steady- state and transient time-response of R-C circuit to a step change in voltage.

Exp 4. Sinusoidal steady state response of R-L and R-L-C circuits- impedance calculation and verification

Exp 5. Measurement of three-phase power in balanced three-phase circuits using Two-Wattmeter method

II - Cycle

Demonstration 2. Demonstration of cut-out sections of machines: DC machine, induction machine, synchronous machine and single-phase machine.

Exp 6. Load test on single phase transformer: measurement of primary and secondary voltages, currents and power.

Exp 7. Three-phase Transformer: Star and Delta connections. Voltage and current relationship.

Exp 8. Torque speed characteristics of separately excited DC motor.

Exp 9.Synchronous speed of two- pole and four-pole, three-phase induction motor, Speed reversal by change of phase-sequence.

Exp 10. Magnetization curve of a separately excited DC Generator

Suggested Reading:

1. J.B.Gupta, “Fundamentals of Electrical Engineering and Electronics” S.K.Kataria & Sons Publications, 2002.
2. J.B.Gupta, “Utilization of Electric Power and Electric Traction” S.K.Kataria & Sons Publications, 2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda,“ Basic Elactrical Engineering Tata McGraw Hill, Publications, 2009
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

With effect from the academic year 2018-2019

ME 151 ES

WORKSHOP PRACTICE

Instruction	6 Periods per week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	3

Course Objectives:

- To learn about different tools used in workshop.
- To understand the different manufacturing processes.
- To learn about fabrication of components using different materials.

Course Outcomes:

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

1.	Machine shop	**(10 hours)**
2.	Fitting shop	**(08 hours)**
3.	Carpentry	**(06 hours)**
4.	Electrical & Electronics	**(08 hours)**
5.	Welding shop	**(08 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6.	Casting	**(08 hours)**
7.	Smithy	**(06 hours)**
8.	Plastic moulding & Glass Cutting	**(06 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Readings:

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.