

**CURRICULUM  
FOR  
ELECTRICAL & ELECTRONICS ENGINEERING**

**SEMESTER - II** (ELECTRICAL & ELECTRONICS ENGINEERING)

S.No	Paper Code	Paper Title	L	T	P	Credits
1	103201	Physics (Waves And Optics And Introduction To Quantum Mechanics)	3	1	3	5.5
2	103202	Mathematics II (Linear Algebra, Transform Calculus & Numerical Methods)	3	1	0	4
3	100201	Basic Electrical Engineering	3	1	2	5
4	100202	Engineering Graphics & Design	1	0	4	3

**PAPER CODE - 103201**

BSC	Physics (Waves And Optics, And Introduction To Quantum Mechanics)	L:3	T:1	P:3	Credit:5.5
-----	---	-----	-----	-----	------------

**Detailed contents:**

**Module 1**

**Waves:** Mechanical And Electrical Simple Harmonic Oscillators, Damped Harmonic Oscillator, Forced Mechanical And Electrical Oscillators, Impedance, Steady State Motion Of Forced Damped Harmonic Oscillator

**Module 2**

**Non-Dispersive Transverse And Longitudinal Waves:** Transverse Wave On A String, The Wave Equation On A String, Harmonic Waves, Reflection And Transmission Of Waves At A Boundary, Impedance Matching, Standing Waves And Their Eigen Frequencies, Longitudinal Waves And The Wave Equation For Them, Acoustics Waves.

## Module 3

**Light And Optics:** Light As An Electromagnetic Wave And Fresnel Equations, Reflectance and Transmittance, Brewster's Angle, Total Internal Reflection, And Evanescent Wave. Mirrors And Lenses And Optical Instruments Based On Them.

## Module 4

**Wave Optics:** Huygens' Principle, Superposition Of Waves And Interference Of Light by Wavefront Splitting And Amplitude Splitting; Young's Double Slit Experiment, Newton's Rings, Michelson Interferometer, Mach Zehnder Interferometer. Fraunhofer Diffraction From A Single Slit And A Circular Aperture, The Rayleigh Criterion For Limit Of Resolution And Its Application To Vision; Diffraction Gratings And Their Resolving Power.

## Module 5

**Lasers:** 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, Co<sub>2</sub>), Solid-State Lasers (Ruby, Neodymium), Dye Lasers; Properties Of Laser Beams: Mono-Chromaticity.

## Module 6

**Introduction To Quantum Mechanics:** Wave Nature Of Particles, Time-Dependent And Time-Independent Schrodinger Equation For Wave Function, Born Interpretation, Probability Current, Expectation Values, Free-Particle Wave Function And Wave-Packets, Uncertainty Principle.

## Module 7

**Solution Of Wave Equation:** Solution Of Stationary-State Schrodinger Equation For One Dimensional Problems - Particle In A Box, Particle In Attractive Delta-Function Potential, Square-Well Potential, Linear Harmonic Oscillator.

Scattering From A Potential Barrier And Tunneling; Related Examples Like Alpha-Decay, Field-Ionization And Scanning Tunneling Microscope, Tunneling In Semiconductor Structures. Three- Dimensional Problems: Particle In Three Dimensional Box And Related Examples.

## Module 8

**Introduction To Solids And Semiconductors:** Free Electron Theory Of Metals, Fermi Level, Density Of States In 1, 2 and 3 Dimensions, Bloch's Theorem For Particles In A Periodic Potential, Kronig - Penney Model And Origin Of Energy Bands. Types Of Electronic Materials: Metals, Semiconductors, And Insulators. Intrinsic And Extrinsic Semiconductors, Dependence Of Fermi Level On Carrier - Concentration And Temperature (Equilibrium Carrier Statistics), Carrier.

### Suggested Text Books

- G. Main, "Vibrations And Waves In Physics", Cambridge University Press, 1993.
- H. J. Pain, "The Physics Of Vibrations And Waves", Wiley, 2006.
- E. Hecht, "Optics", Pearson Education, 2008.
- A. Ghatak, "Optics", Mcgraw Hill Education, 2012.
- O. Svelto, "Principles Of Lasers", Springer Science & Business Media, 2010.
- D. J. Griffiths, "Quantum Mechanics", Pearson Education, 2014.
- R. Robinett, "Quantum Mechanics", Oup Oxford, 2006.
- D. Mcquarrie, "Quantum Chemistry", University Science Books, 2007.
- D. A. Neamen, "Semiconductor Physics And Devices", Times Mirror High Education Group, Chicago, 1997.
- E.S. Yang, "Microelectronic Devices", Mcgraw Hill, Singapore, 1988.
- B.G. Streetman, "Solid State Electronic Devices", Prentice Hall Of India,

### PAPER CODE - 100201

ESC	Basic Electrical Engineering	L:3	T:1	P:2	Credit:5
-----	------------------------------	-----	-----	-----	----------

## Detailed contents:

### Module 1

**DC Circuits:** Electrical Circuit Elements (R, L And C), Voltage And Current Sources, Kirchhoff Current And Voltage Laws, Analysis Of Simple Circuits With DC Excitation. Star-Delta Conversion, Network Theorems (Superposition, Thevenin, Norton And Maximum Power Transfer Theorems). Time-Domain Analysis Of First- Order RL and RC Circuits

### Module 2

**Ac Circuits:** Representation Of Sinusoidal Waveforms, Peak, RMS And Average Values (Form Factor And Peak Factor), Impedance Of Series And Parallel Circuit, Phasor Representation, Real Power, Reactive Power, Apparent Power, Power Factor, Power Triangle. Analysis Of Single-Phase AC Circuits Consisting Of R, L, C, RL, RC, RLC Combinations (Series And Parallel), Resonance. Three-Phase Balanced Circuits, Voltage And Current Relations In Star And Delta Connections.

### Module 3

**Magnetic Circuits:** Introduction, Series And Parallel Magnetic Circuits, Analysis Of Series And Parallel Magnetic Circuits.

### Module 4

**Transformers:** Magnetic Materials, BH Characteristics, Ideal And Practical Transformer, EMF Equation, Equivalent Circuit, Losses In Transformers, Regulation And Efficiency. Auto-Transformer And Three-Phase Transformer Connections.

## Module 5

**Electrical Machines:** Construction, Working, Torque-Speed Characteristic And Speed Control Of Separately Excited DC Motor. Generation Of Rotating Magnetic Fields, Construction And Working Of A Three-Phase Induction Motor, Significance Of Torque-Slip Characteristic. Loss Components And Efficiency, Starting And Speed Control Of Induction Motor. Construction And Working Of Synchronous Generators.

## Module 6

**Electrical Installations:** Components Of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types Of Wires And Cables, Earthing. Types Of Batteries, Important Characteristics For Batteries. Elementary Calculations For Energy Consumption, Power Factor Improvement And Battery Backup.

### Suggested Text/Reference Books:

- D. P. Kothari And I. J. Nagrath, "Basic Electrical Engineering", Tata Mcgraw Hill, 2010.
- D. C. Kulshreshtha, "Basic Electrical Engineering", Mcgraw Hill, 2009.
- L. S. Bobrow, "Fundamentals Of Electrical Engineering", Oxford University Press, 2011.
- E. Hughes, "Electrical And Electronics Technology", Pearson, 2010.
- V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
- Basic Electrical Engineering By Fitzgerald, Et Al, Tata Mcgraw Hill
- Fundamentals Of Electrical Engg. By R. Prasad, Phi Publication
- Basic Electrical Engineering By V.K. Mehta And Rohit Mehta, S.Chand Publication.

### Course Outcomes:

To Understand And Analyze Basic Electric And Magnetic Circuits.  
To Study The

Working Principles Of Electrical Machines And Power Converters.To  
Introduce The Components Of Low Voltage Electrical Installations.

### PAPER CODE - 100102 || 100202

ESC	Engineering Graphics & Design	L:3	T:0	P:4	Credit:5
-----	-------------------------------	-----	-----	-----	----------

#### Traditional Engineering Graphics:

Principles Of Engineering Graphics; Orthographic Projection;  
Descriptive  
Geometry; Drawing Principles; Isometric Projection; Surface  
Development; Perspective;  
Reading A Drawing; Sectional Views; Dimensioning & Tolerances; True  
Length, Angle; Intersection, Shortest Distance.

#### Computer Graphics:

Engineering Graphics Software; -Spatial Transformations;  
Orthographic  
Projections; Model Viewing; Coordinate Systems; Multi-View Projection;  
Exploded Assembly; Model Viewing; Animation; Spatial Manipulation;  
Surface Modelling; Solid Modelling, Introduction To Building  
Information Modelling (Bim).

**Exc** **The Basic Essential Concepts Most of The Teaching Part Can Happen**  
(Except The Basic Essential Concepts, Most Of The Teaching  
**Concurrently In The Laboratory)**

Part Can Happen Concurrently In The Laboratory)

#### Module 1

**Introduction To Engineering Drawing:** 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; Scales - Plain, Diagonal And Vernier Scales

#### Module 2

**Orthographic Projections:** Principles Of Orthographic Projections-  
Conventions  
-Projections Of Points And Lines Inclined To Both Planes; Projections  
Of Planes Inclined Planes - Auxiliary Planes.



## Module 3

**Projections Of Regular Solids:** Those Inclined To Both The Planes- Auxiliary Views; Draw Simple Annotation, Dimensioning And Scale. Floor Plans That Include: Windows, Doors, And Fixtures Such As Wc, Bath, Sink, Shower, Etc.

## Module 4

**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; Draw The Sectional Orthographic Views Of Geometrical Solids, Objects From Industry And Dwellings (Foundation To Slab Only).

## Module 5

**Isometric Projections:** 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 6

**Overview Of Computer Graphics:** Listing The Computer Technologies That Impact On Graphical Communication, Demonstrating Knowledge Of The Theory Of Cad Software [Such As: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify And Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog Boxes And Windows, Shortcut Menus (Button Bars), The Command Line (Where Applicable), 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 7

**Customisation & Cad Drawing:** Consisting Of Set Up Of The Drawing Page And The Printer, Including Scale Settings, Setting Up Of Units And Drawing Limits; Iso And Ansi Standards For Coordinate Dimensioning And Tolerancing; Orthographic Constraints, 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.

## Module 8

**Annotations, Layering & Other Functions:** Covering Applying Dimensions To Objects, Applying Annotations To Drawings; Setting Up And Use Of Layers, Layers To Create Drawings, Create, Edit And Use Customized Layers; Changing Line Lengths Through Modifying Existing Lines (Extend/Lengthen); Printing Documents To Paper Using The Print Command; Orthographic Projection Techniques; Drawing Sectional Views Of Composite Right Regular Geometric Solids And Project The True Shape Of The Sectioned Surface; Drawing Annotation, Computer-Aided Design (CAD) Software Modeling Of Parts And Assemblies. Parametric And Non-Parametric Solid, Surface, And Wireframe Models. Part Editing And Two-Dimensional Documentation Of Models. Planar Projection Theory, Including Sketching Of Perspective, Isometric, Multiview, Auxiliary, And Section Views. Spatial Visualization Exercises. Dimensioning Guidelines, Tolerancing Techniques; Dimensioning And Scale Multi Views Of Dwelling.

## Module 9

**Demonstration Of A Simple Team Design Project That Illustrates:** 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; Meshed Topologies For Engineering Analysis And Tool-Path Generation For Component



Manufacture; Geometric Dimensioning And Tolerancing; Use Of Solid-Modeling Software For Creating Associative Models At The Component And Assembly Levels. Floor Plans That Include: Windows, Doors, And Fixtures Such As Wc, Bath, Sink, Shower, Etc. Applying Colour Coding According To Building Drawing Practice; Drawing Sectional Elevation Showing Foundation To Ceiling; Introduction To Building Information Modelling (Bim).

### **Suggested Text Books:**

- Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- Shah, M.B. & Rana B.C. (2008), Engineering Drawing And Computer Graphics, Pearson Education
- Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, Tmh Publication
- Narayana, K.L. & P Kannaiah (2008), Text Book On Engineering Drawing, Sci Tech Publishers (Corresponding Set Of) Cad Software Theory And User Manuals.

### **The Student Will Learn:**

- 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 Modelling
- Exposure To Computer-Aided Geometric Design
- Exposure To Creating Working Drawings
- Exposure To Engineering Communication

**PAPER CODE - 103202**

<b>BSC</b>	<b>Mathematics -II (Linear Algebra, Transform Calculus And Numerical Methods)</b>	<b>L:3</b>	<b>T:1</b>	<b>P:0</b>	<b>Credit:4</b>
------------	---	------------	------------	------------	-----------------

### **Detailed contents:**

#### **Module 1**

**Matrices:** Algebra Of Matrices, Inverse And Rank Of A Matrix, Rank-Nullity

Theorem; System Of Linear Equations; Symmetric, Skew-Symmetric And Orthogonal Matrices; Determinants; Eigenvalues And Eigenvectors; Diagonalization Of Matrices; Cayley-Hamilton Theorem, Orthogonal Transformation And Quadratic To Canonical Forms.

## Module 2

**Numerical Methods-I:** Solution Of Polynomial And Transcendental Equations -  
Bisection Method, Newton-Raphson Method And Regula-Falsi Method.  
Finite Differences,  
Interpolation Using Newton's Forward And Backward Difference Formula.  
Central  
Difference Interpolation: Gauss's Forward And Backward Formulae.  
Numerical Integration: Trapezoidal Rule And Simpson's  $1/3$ rd And  $3/8$   
Rules.

## Module 3

**Numerical Methods-II:** Ordinary Differential Equations: Taylor's  
Series, Euler  
And Modified Euler's Methods. Runge- Kutta Method Of Fourth Order For  
Solving First  
And Second Order Equations. Milne's And Adams Predictor-Corrector  
Methods. Partial  
Differential Equations: Finite Difference Solution Two Dimensional  
Laplace Equation  
And Poisson Equation, Implicit And Explicit Methods For One  
Dimensional Heat Equation Bender-Schmidt And Crank-Nicolson Methods),  
Finite Difference Explicit Method For Wave Equation.

## Module 4

**Transform Calculus:** Laplace Transform, Properties Of Laplace  
Transform,  
Laplace Transform Of Periodic Functions. Finding Inverse Laplace  
Transform By  
Different Methods, Convolution Theorem. Evaluation Of Integrals By  
Laplace Transform, Solving Odes And Pdes By Laplace Transform Method.  
Fourier Transforms.

### **Suggested Text Books:**

- D. Poole, "Linear Algebra: A Modern Introduction", Brooks/Cole, 2005.
- N.P. Bali And M. Goyal, "A Textbook Of Engineering Mathematics'", Laxmi Publications, 2008.
- B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2010.
- V. Krishnamurthy, V. P. Mainra And J. L. Arora, "An Introduction To Linear Algebra", Affiliated East-West Press, 2005.

\*\*\*\*\*



*Bihar Universities*