AKU B.E./B.Tech IT Sem 1 syllabus

Engineering Graphics & Design

PAPER CODE – 100102 || 100202
ESC ENGINEERING GRAPHICS & DESIGN

CREDIT:3

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/REFERENCE 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, SCITECHPUBLISHERS
- (CORRESPONDING SET OF) CAD SOFTWARE THEORY AND USER MANUALS

Physics (Semiconductor Physics)

PAPER CODE - 105101 || 105201

BSC PHYSICS (SEMICONDUCTOR PHYSICS)

CREDIT:5.5

MODULE 1: REVIEW OF SEMICONDUCTOR PHYSICS
E-K DIAGRAM, DENSITY OF STATES, OCCUPATION PROBABILITY, FERMI LEVEL AND QUASI-FERMI LEVEL (VARIATION BY CARRIER CONCENTRATION AND TEMPERATURE); P-N JUNCTION, METAL-SEMICONDUCTOR JUNCTION (OHMIC AND SCHOTTKY); CARRIER TRANSPORT, GENERATION, AND RECOMBINATION; SEMICONDUCTOR MATERIALS OF INTEREST FOR OPTOELECTRONIC DEVICES, BANDGAP MODIFICATION, HETEROSTRUCTURES; LIGHT- SEMICONDUCTOR INTERACTION: RATES OF OPTICAL TRANSITIONS, JOINT DENSITY OF STATES, CONDITION FOR OPTICAL AMPLIFICATION.

MODULE 2: SEMICONDUCTOR LIGHT EMITTING DIODES (LEDS)
RATE EQUATIONS FOR CARRIER DENSITY, RADIATIVE AND NON-RADIATIVE RECOMBINATION MECHANISMS IN SEMICONDUCTORS, LED: DEVICE STRUCTURE, MATERIALS, CHARACTERISTICS, AND FIGURES OF MERIT.

MODULE 3: SEMICONDUCTOR LASERS
REVIEW OF LASER PHYSICS; RATE EQUATIONS FOR CARRIER- AND PHOTON-DENSITY, AND THEIR STEADY STATE SOLUTIONS, LASER DYNAMICS, RELAXATION OSCILLATIONS, INPUT-OUTPUT CHARACTERISTICS OF LASERS. SEMICONDUCTOR LASER: STRUCTURE, MATERIALS, DEVICE CHARACTERISTICS, AND FIGURES OF MERIT; DFB, DBR, AND VERTICAL- CAVITY SURFACE-EMITTING LASERS (VECSEL), TUNABLE SEMICONDUCTOR LASERS.

MODULE 4: PHOTODETECTORS
TYPES OF SEMICONDUCTOR PHOTODETECTORS -P-N JUNCTION, PIN, AND AVALANCHE AND THEIR STRUCTURE, MATERIALS, WORKING PRINCIPLE, AND CHARACTERISTICS, NOISE LIMITS ON PERFORMANCE; SOLAR CELLS.

MODULE 5: LOW-DIMENSIONAL OPTOELECTRONIC DEVICES
QUANTUM-WELL, -WIRE, AND -DOT BASED LEDS, LASERS, AND PHOTODETECTORS.

SUGGESTED TEXT/REFERENCE BOOKS

- J. SINGH, SEMICONDUCTOR OPTOELECTRONICS: PHYSICS AND TECHNOLOGY, MCGRAW- HILL INC. (1995).
- B. E. A. SALEH AND M. C. TEICH, FUNDAMENTALS OF PHOTONICS, JOHN WILEY & SONS,
- S. M. SZE, SEMICONDUCTOR DEVICES: PHYSICS AND TECHNOLOGY, WILEY (2008).
- YARIV AND P. YEH, PHOTONICS: OPTICAL ELECTRONICS IN MODERN COMMUNICATIONS, OXFORD UNIVERSITY PRESS, NEW YORK (2007).
- P. BHATTACHARYA, SEMICONDUCTOR OPTOELECTRONIC DEVICES, PRENTICE HALL OF INDIA (1997).
- ONLINE COURSE: “SEMICONDUCTOR OPTOELECTRONICS” BY M R SHENOY ON NPTEL
- ONLINE COURSE: "OPTOELECTRONIC MATERIALS AND DEVICES" BY MONICA KATIYAR AND DEEPAK GUPTA ON NPTEL

Basic Electrical Engineering

PAPER CODE – 100101 || 100201
ESC BASIC ELECTRICAL ENGINEERING

CREDIT:5

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 FITZERALD, 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

Mathematics –I (Calculus & Linear Algebra)

PAPER CODE – 102102
BSC MATHEMATICS –I (CALCULUS & LINEAR ALGEBRA)

CREDIT:4

MODULE 1: CALCULUS:
EVOLUTES AND INVOLUTES; EVALUATION OF DEFINITE AND IMPROPER INTEGRALS; BETA AND GAMMA FUNCTIONS AND THEIR PROPERTIES; APPLICATIONS OF DEFINITE INTEGRALS TO EVALUATE SURFACE AREAS AND VOLUMES OF REVOLUTIONS.

MODULE 2: CALCULUS:
ROLLE’S THEOREM, MEAN VALUE THEOREMS, TAYLOR’S AND MACLAURIN THEOREMS WITH REMAINDERS; INDETERMINATE FORMS AND L'HOSPITAL'S RULE; MAXIMA AND MINIMA.

MODULE 3: SEQUENCES AND SERIES:
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.

MODULE 4: MULTIVARIABLE CALCULUS (DIFFERENTIATION):
LIMIT, CONTINUITY AND PARTIAL DERIVATIVES, DIRECTIONAL DERIVATIVES, TOTAL DERIVATIVE; TANGENT PLANE AND NORMAL LINE; MAXIMA, MINIMA AND SADDLE POINTS; METHOD OF LAGRANGE MULTIPLIERS; GRADIENT, CURL AND DIVERGENCE.

MODULE 5: 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, AND ORTHOGONAL TRANSFORMATION.

SUGGESTED TEXT/REFERENCE BOOKS

- G.B. THOMAS AND R.L. FINNEY, CALCULUS AND ANALYTIC GEOMETRY, 9TH EDITION, PEARSON, REPRINT, 2002.
- ERWIN KREYSZIG, ADVANCED ENGINEERING MATHEMATICS, 9TH EDITION, JOHN WILEY & SONS, 2006.
- VEERARAJAN T., ENGINEERING MATHEMATICS FOR FIRST YEAR, TATA MCGRAW-HILL, NEW DELHI, 2008.
- RAMANA B.V., HIGHER ENGINEERING MATHEMATICS, TATA MCGRAW HILL NEW DELHI, 11TH REPRINT, 2010.
- D. POOLE, LINEAR ALGEBRA: A MODERN INTRODUCTION, 2ND EDITION, BROOKS/COLE, 2005.
- N.P. BALI AND MANISH GOYAL, A TEXT BOOK OF ENGINEERING MATHEMATICS, LAXMI PUBLICATIONS, REPRINT, 2008.
- B.S. GREWAL, HIGHER ENGINEERING MATHEMATICS, KHANNA PUBLISHERS, 36TH EDITION, 2010.