AKU B.E./B.Tech ECE Sem 2 syllabus

Mathematics II

PAPER CODE - 103202
BSC MATHEMATICS –II (LINEAR ALGEBRA, TRANSFORM CALCULUS AND NUMERICAL METHODS)

CREDIT:4

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 FORMULAE. CENTRAL DIFFERENCE INTERPOLATION: GAUSS'S FORWARD AND BACKWARD FORMULAE. NUMERICAL INTEGRATION: TRAPEZOIDAL RULE AND SIMPSON'S 1/3RD 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 ADAM'S PREDICATOR-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-NICHOLSON 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.

TEXT / REFERENCES:

- D. POOLE, “LINEAR ALGEBRA: A MODERN INTRODUCTION”, BROOKS/COLE, 2005.
- N.P. BALI AND M. GOYAL, “A TEXT BOOK 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.

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 (Waves and Optics, and Introduction to Quantum Mechanics)

PAPER CODE - 103201
BSC PHYSICS (WAVES AND OPTICS, AND INTRODUCTION TO QUANTUM MECHANICS)

CREDIT:5.5

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. FARUNHOFER 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, CO2), 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 GENERATION AND RECOMBINATION, CARRIER TRANSPORT: DIFFUSION AND DRIFT, P -N JUNCTION.

TEXT / REFERENCES:

- 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, “UANTUM 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, 1995

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