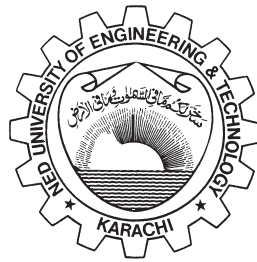


**PROSPECTUS FOR  
CONVERSION COURSE (2 Years) 2008-2009  
FOR B.TECH ( PASS )**



**CIVIL, MECHANICAL & ELECTRICAL  
FACULTIES**

**NED ACADEMY  
CENTRE FOR CONTINUING ENGINEERING EDUCATION (CCEE)  
Email: [anis@neduet.edu.pk](mailto:anis@neduet.edu.pk), [ccee@neduet.edu.pk](mailto:ccee@neduet.edu.pk)  
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# 1. INTRODUCTION TO CENTRE FOR CONTINUING ENGINEERING EDUCATION

## **General :**

The NED University of Engineering & Technology has accelerated its efforts to contribute to research and training programmes. Fast developing fields of science and technology require support, development and use of educational technology, distance education, computer-based training and open-learning schemes, and enhancement of the learning process through the use of Information Technology (IT). To achieve these goals the NED University established a Centre for Continuing Engineering Education (CCEE) in 1998 to cater to the educational and training needs of the existing engineering workforce.

An educational approach to engineering education is required by introducing technical activities, sharing of ideas and experiences, and keeping track of new developments for enhancing good business and professional opportunities, as well as facilitating quality of education. Continuing engineering education enables professionals to attain higher levels of research, teaching and industrial co-operation. It brings together new research, new practitioners, new technologies and new experiences for the mutual benefits of all concerned. The applicant who wishes to join these courses must at least be a graduate (bachelor degree).

The CCEE brings University and Industry together with successful models of Industry-University partnerships. Continuing Education transfers know-how in a timely manner and to the right people. The job is made easier with distance education, along with the use of IT. The CCEE, since its inception has offered numerous courses which are widely welcomed by the engineering community. One of the recent programmes offered is to introduce postgraduate certificate course at Masters level.

In addition to above, to bring talented and bright BTech ( Pass ) graduates into main stream of Engineering, CCEE by offering them 2 year "Conversion Course" for B. Tech ( Pass ) graduates to upgrade their academic qualifications. Each registered student in this Conversion course will be awarded a Certificate on successful completion and allowed to get admission directly in Third Year Engineering in the appropriate discipline provided they pass the Pre-Admission Entry Test.

## **Internet Facility :**

CCEE in collaboration with Internet Centre will allow Conversion Course students to use Internet Facility and network services in evening . Network services operate round-the-clock, throughout the year providing access to databases and information agencies, linkage with libraries, industry, universities, resource sharing and e-mail services.

**Central Library :**

CCEE incollaboration with Chief Librarian will allow students of Conversion Course to become member of the Library for issuance of books according to Library procedure. The library collection includes general circulation books (which include text books), reference books e.g. encyclopedias, handbooks etc., periodicals on current list of subscription as well as volumes of previous issues of journals, government documents, Archive material which includes acts and ordinances, services rules, statistical reports, census reports, survey reports, policies, planning reports and budget etc, and Microfilms, Microfiches, Audio/Video cassettes, CD-ROMs etc.

The library offers specialized services on University campus utilizing computerized retrieval of bibliographical databases containing references of thousands of articles, books, proceedings, technical reports and statistics. This service is available to library patrons through Intranet & Internet. The Library Information Service offers a full range of research and consulting services to commercial organizations, institutions and individuals. A vast variety of on-line services are also available.

**Medical Centre :**

The Medical Centre is located near Dean's offices. There are three Doctors including one Lady Medical Officer, besides paramedical staff including one Female Nurse. The Medical Centre offers numerous facilities to the students and the employees of the university. This includes: First Aid including cardiac and breathing supports, ambulance service, pathological Laboratory for routine computerized medical tests on minimal charges, and E.C.G. (Electro cardiography).

**Other Facilities :**

Other facilities which CCEE uses are class rooms, drawing halls, laboratories, the Main Library, Circulation Library and Aneela Azam Reading Room, Audio-Visual Centre, Internet Centre, Auditorium, Student Centre, Cafeteria. CCEE shall arrange faculty members from various disciplines of the university to each offered courses, and any laboratory work needed shall be performed in the laboratories available in the university.

## 2. ADMINISTRATION

### Conversion Course for BTech (Pass)

FAX: (92-21) 9261255

	Telephone	
	Office	Residence
<b>Vice-Chancellor</b>		
<b>A. Kalam. C.Eng.</b> <i>M.A.; B.Sc.; FIEE; F.I. Mech. E.; FCILT. (UK)</i>	926-1253 926-1261-8 PABX/2242	588-7660
<b>Pro Vice-Chancellor</b>		
<b>Prof Dr Shamsul Haque</b> <i>B.Sc. (Hons); M.Sc. (Maths.); M.Phil. (Maths., Karachi); Ph.D. (Aberdeen, UK); Life Member APMA &amp; KMA</i>	926-1261-8 PABX/2253	
<b>Director General - NED Academy</b>		
<b>Prof. Nazimuddin Qureshi</b> <i>B.Sc; B.E (Mech); M.S. (USA); Ph.D. (USA) CMfgE (SME); Mem.IE (Pak)</i>	926-1261-8 PABX/2329	464-2937
<b>Director - Centre for Continuing Engineering Education</b>		
<b>Engr.Syed Anis-ul Qadr</b> <i>BE ( Civil ); MSc ( Soil Mechanics; Heriot-Watt, UK ); PGC ( Japan )</i>	926-1261-8 PABX/2297	926-1986
<b>Registrar</b>		
<b>Engr Javed Aziz Khan</b> <i>B.E. (Civil); ME.(Env. Engg) Bangkok</i>	926-1257 926-1261-8	668-9125
<b>Chief Librarian</b>		
<b>Ms Meher Yasmeen</b> <i>B.A. (KU); D.L.S. (KU); M.L.S. (KU)</i>	926-1261-8 PABX/2229	481-3010

### 3. PROGRAMME DETAILS

#### 3.1 OBJECTIVE

CCEE offers Conversion Course for B.Tech Pass (2 Years) studies programme in Civil, Mechanical & Electrical Engineering Faculties now for the Academic Session 2008-2009.

After successful completion 15 meritorious candidates from each Faculty will be offered admission in 3<sup>rd</sup> Year Engineering in the appropriate department of the Faculty.

#### 3.2 SCHEME OF STUDY

- i) The programme shall be conducted under Semester System
- ii) The programme shall be conducted in the evening
- iii) The minimum period of study will be 4 semesters or two years duration and a maximum of three years will be allowed for successful completion of all requirements of the conversion course.

#### 3.3 ELIGIBILITY

- Candidates who are domiciled in Sindh Province.
- B.Tech Pass (2 years). Preference shall be given to applicants who also have DAE with Higher Secondary School HSC (Pre-Engineering) Examination from Karachi or other Sindh Boards or Federal Board or equivalent foreign examination with combination of Physics, Chemistry and Mathematics, with at least 55% aggregate marks.
- Must qualify Admission Test for Conversion Course Admissions to be organized / conducted by CCEE / departments.

#### FEE STRUCTURE

The following are the University fees for Conversion Course for B.Tech programme.

1.	Admission Fee (to be paid once)	Rs. 500/-
2.	Tuition Fee per Course	Rs. 5000/-
3.	Library Fee	Rs. 100/-
4.	Examination Fee per Course	Rs. 500/-
5.	Registration Fee	Rs. 100/-
6.	Security Deposit (to be paid once)	Rs. 500/-

### **3.3.1 Admission Criteria and Procedure**

**3.3.1.1** For admission candidate must have B.Tech (Pass )2 Years in Civil / Electrical / Mechanical with minimum CGPA 3, which is recognized by NED University of Engineering & Technology.

**3.3.1.2** The admission will be granted on the basis of merit. Merit list of successful candidates will be prepared in accordance with the following criteria as under:

- a) The candidates eligible for admission shall be selected on criteria based on the admission test, Matric, Intermediate / DAE and B. Tech Pass Examination results.
- b) Cases of tie in the merit list shall be resolved by the DG-NED Academy / PVC.

**3.3.1.3** Applications for admission in B.Tech ( Pass ) Conversion Course (2 Years) in Civil, Electrical & Mechanical Engineering Faculties shall be made in writing on the prescribed form obtainable from the National Bank of Pakistan NED branch along with prospectus and should be submitted to the Program Manager / Director CCEE by hand. Any application received after the closing date as announced in local news papers / Notice Boards shall not be entertained. Application and documents once received shall not be returned.

**3.3.1.4** Selected candidates for admission to the program will be informed of their selection by notification. The names of all the selected candidates after necessary approval will be displayed on the CCEE Notice Boards as well as CCEE webpage.

**3.3.1.5** The selected candidates will be required to report to the Director CCEE for verification of their documents and payment of prescribed fees. Fees shall be deposited in NBP-NED branch using bank challan available at CCEE office and / or fees can be paid by crossed cheque payable to “CCEE-NED University”. Furthermore complete the registration documents within 7 days of the date of announcement of the admission notification.

### **3.4 Distribution of Seats**

#### **3.4.1 Civil Engineering:**

- a) 10 seats for the candidates who passed their B.Tech (Pass) examination from a Government College / Institute located in Karachi.
- b) 05 seats for the candidates who have passed their B.Tech (Pass) examination from a Government College / Institute other than Karachi located in Sindh Province.

**Total Seats: 15**

**N.B. The seats are inter-transferable, whenever considered necessary by the University.**

### **3.4.2 Mechanical Engineering:**

- a) 10 seats for the candidates who passed their B.Tech (Pass) examination from a Government College / Institute located in Karachi.
- b) 05 seats for the candidates who have passed their B.Tech (Pass) examination from a Government College / Institute other than Karachi located in Sindh Province.

Total Seats: **15**

**N.B. The seats are inter-transferable, whenever considered necessary by the University.**

### **3.4.3 Electrical Engineering:**

- a) 10 seats for the candidates who passed their B.Tech (Pass) examination from a Government College / Institute located in Karachi.
- b) 05 seats for the candidates who have passed their B.Tech (Pass) examination from a Government College / Institute other than Karachi located in Sindh Province.

Total Seats: **15**

**N.B. The seats are inter-transferable, whenever considered necessary by the University.**

## **3.5 Medium of Instruction**

Instruction in all courses and laboratories will be carried out in English language.

## **3.6 Duration of Programme & Time Schedule**

The minimum period of study will be 4 semesters or two years duration and a maximum of three years will be allowed for successful completion of all requirements of the Conversion Course for B.Tech Pass (2 Years).

There shall be two semesters in each academic year. Each semester shall be of twenty weeks duration. Out of this period sixteen weeks shall be the actual teaching time and four weeks be utilized for the conduct of examinations, preparation and declaration of results, etc. The fall semester will start in August and the spring semester will start in January each year.

The classes will be held in the evening on week days except Sunday and other listed holidays.

## **3.7 Class Attendance**

The students are expected to attend the classes regularly and submit the home assignment when due. A candidate with less than 75% attendance will not be allowed to take the final examination in a course.

### 3.8 CANCELLATION OF ADMISSION

The admission of a student enrolled in the programme will be cancelled under the following circumstances:

- i) If the student does not attend classes without any official withdrawal.
- ii) If the student is involved in serious in-discipline.
- iii) If a student fails to make up the deficiency in courses.
- iv) If the student fails to register in a semester
- v) If any other exigency arises necessitating cancellation of admission.

### 3.9 EXAMINATION

#### 3.9.1 Grade Point Averages

- (a) The following grades with the equivalent marks (%) and grade points as shown below shall be awarded to the students on the basis of their performance in each course of study.

Grade	Points	Marks (%)	Remarks
A	4	85-100	Excellent
B <sup>+</sup>	3.5	77-84	Very Good
B	3	70-76	Good
C <sup>+</sup>	2.5	65-69	Above Average
C	2	60-64	Average
D <sup>+</sup>	1.5	55-59	Fair
D	1	50-54	Pass
F	0	Below 50	Fail

- (b) Academic performance shall be determined on the basis of grade point averages. The grade points (GP) earned by a student in each course shall be calculated by multiplying the course credits by the points obtained. The cumulative grade point (CGP) shall be calculated by adding all the GP of the courses offered in various quarters. The cumulative grade point average (CGPA) shall then be calculated by dividing the CGP earned by the total course credits. The minimum CGPA for qualifying the Conversion Course for B.Tech Pass shall be 2.5.

### 3.9.2 Performance in Examination

There shall be a final examination at the end of semester to be conducted by CCEE in collaboration with the Controller of Examinations. The concerned course teacher will be the examiner, who will set the paper and assess the scripts.

**N.B.** The numerical weightage for final examination will be 70% for theory examination of each course. 30% numerical weightage will be assigned to midterm test / tutorial / practical conducted by course teacher.

## 4. COURSES OF STUDY

### 4.1 Course of Study for Faculty of Civil Engineering

Course No.	Course Title	Credit Hours
HS 01	English	03
MS 01	Calculus	03
MS 02	Differential Equations, Probability & Statistics	03
MS 03	Engineering Sciences	03
CE 01	Engineering Surveying	03
CE 02	Mechanics of Solids	03
CE 03	Analysis of Determinate Structures	03
CE 04	Fluid Mechanics	03
CE 05	Civil Engineering Drawing & Graphics	03
CE 06	Engineering Mechanics	03

### 4.2 Course of Study for Faculty of Mechanical Engineering

Course No.	Course Title	Credit Hours
HS 01	English	03
MS 01	Calculus	03
MS 02	Ordinary Differential Equations and Fourier Series	03
ME 01	Thermodynamics	03
ME 02	Solid Mechanics	03
ME 03	Materials & Manufacturing Processes	03
ME 04	Fluid Mechanics	03
ME 05	Elements of Machine Dynamics & Design	03
ME 06	Computer Programming & Drafting	03
ME 07	Engineering Mechanics	03

### 4.3 Course of Study for Faculty of Electrical Engineering

Course No.	Course Title	Credit Hours
HS 01	English	03
MS 01	Calculus	03
MS 04	Complex Variable & Fourier Analysis	03
EE 01	Basic Electrical Engineering	03
EE 02	Circuit Theory	03
EE 03	Electronic Devices & Circuits	03
EE 04	Electrical Machines	03
EE 05	Programming with C-Language	03
EE 06	Electromagnetic Fields	03
EE 07	Logic Design and Computer Architecture	03

## 5. DESCRIPTION OF COURSES

### 5.1 CIVIL ENGINEERING

#### HS 01 ENGLISH

*Report Writing:*

Technical Report Writing.

*Speeches:*

Preparation of Short Speeches for various occasions.

*Written Communication:*

Writing of Formal Letters and Applications, Drafting of Memorandums, Contracts, Advertisements and Tender Notices. Preparation of Minutes of Meeting. Writing Short Papers on Technical Subjects. Notes Taking.

*Oral Communication:*

Oral reporting. Conference Leading. Dictation, Interviewing.

*Précis Writing:*

Précis Writing.

*Essays:*

Essays on technical and non-technical subjects.

*Applied Grammar:*

General Rules for writing correct English, Punctuation, Study of words, Construction and improvement of Sentences. Vocabulary Learning and use of Dictionary.

#### MS 01 CALCULUS

*Complex Numbers:*

Basic Operations, Graphical Representations, Polar and Exponential Forms of Complex Numbers, De'Moivre's Theorem with Applications.

*Functions:*

Hyperbolic Functions and their Graphical representation, Hyperbolic and Trigonometric identities and their relationship, Exponential Functions.

*Differentiation:*

Differentiation and Successive Differentiation and its Application to Rate, Speed and Acceleration, Leibnitz's Theorem and its Applications, Equations of Tangents and Normals, Curvature, Radius and Centre of Curvature, Maxima and Minima of Function of One Variable and its Applications, Convexity and Concavity, Points of Inflexion, Concept of Infinite Series, Taylor's and McLaurin's Series and Expansion of Functions, Errors and Approximations and Limiting Values of Functions.

*Partial Differentiation:*

Partial Differential Coefficient and Chain Rule, Partial Differentiation of an Implicit Function, Total Differential, Euler's Theorem, Applications to Small Errors and Approximations, Statement of Taylor's Theorem of Two Independent Variable and its Applications.

*Integral Calculus:*

Standard Integrals, Function of a Linear Function, Integration by Substitution, by Partial Fractions and by Parts, Integration of Trigonometric Functions, Definite Integrals and their Properties and Reduction Formulae, Curve Tracing in Rectangular and Polar Coordinates.

*Integration Applications:*

Volumes of Solids Of Revolution, Centroid of a Plane Figure, Centre of Gravity of a Solid of Revolution, Lengths of Curves, Surface Revolution, Rules of Pappus, Moment of Inertia, Radius of Gyration, Parallel Axes Theorem, Perpendicular Axes Theorem, Second Moment of Area, Composite Figures, Centres of Pressure and Depth of Centre of Pressure.

*Analytical Solid Geometry:*

Rectangular Co-ordinate Systems in Three Dimensions, Direction Cosines, Plane (Straight Line) and Sphere.

## **MS 02      DIFFERENTIAL EQUATIONS, PROBABILITY & STATISTICS**

*Matrices:*

Basic concept, addition of matrices and its multiplication with a scalar number, Partitioning of matrices, Matrix multiplication and its properties, Special matrices, transpose of a matrix, Adjoin and inverse of a square matrix, Row operations Echelon & reduced Echelon form of matrix, rank of matrix, Application of Matrices, Eigen values and Eigenvectors

*1st Order Differential:*

Basic Concept, formation of differential equations and solution.

*Equations:*

Differential equations by direct integration and by separating the variables Homogeneous equations and reducible to homogeneous form, Linear differential equations of the 1st order and equations reducible to the linear form, Bernoulli's equations and orthogonal trajectories, Application in Engineering

*2nd and Higher:*

Special types of  $n^{\text{th}}$  order differential equations with constant

*Orders Equations:*

Coefficients and their solutions, The operator D, Inverse operator  $1/D$ , Solution of differential

equations by operator D methods, Special cases, Cauchy's differential equations, Simultaneous differential equations, Simple application of differential equations in Engineering.

*Partial Differential Equations:*

Basic concepts and formation of partial differential equations, Linear homogeneous partial differential equations and relations to ordinary differential equations, Solution of first order linear and special types of second and higher order differential equations, D'Alembert's solution of the wave equation and two dimensional wave equations, Lagrange's solution, Various standard forms.

*Fourier Series:*

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients. Expansion of functions with arbitrary periods, Odd and even functions and their Fourier series, Half range expansions of Fourier series.

*Presentation of Data:*

Classification, tabulation, classes, graphical representation, histograms, frequency polygons, frequency curves and their types.

*Measures of Central Tendency & Dispersion:*

Means: A.M., G.M., H.M., and their properties. Weighted mean, median, mode and their relations, Merits and demerits of averages. Range, mean deviation, standard deviation, variance & its coefficients and kurtosis.

*Simple Regression:*

Scatter diagram, linear regression and correlation

*Probability & Distributions:*

Definitions, sample space, events. Laws of probability, conditional probability, Dependent and independent events. Binomial, Poisson, uniform, exponential and normal distribution functions.

## **MS 03      ENGINEERING SCIENCES**

*Vectors:*

Basic Concept, Scalar and Vector Product of Two Vectors and their Physical Meanings, Application to Geometry and Mechanics, Algebra of Vectors, Scalar and Vector Triple Products and their Applications.

*Pressure and Energy:*

Stress and Strain, Pressure and Gauge Pressure, Archimedes Principle, Surface Tension and Capillary, Bernoulli's Equation, Viscosity, Poiseville Law

*Optics and Waves:*

Oscillation and Waves, Wave Motion, Principle of Superposition, Electromagnetic Waves, Reflection and Refraction, Interference, Diffraction and Polarization, Waves in Elastic Media, Sound Waves, Waves in more than One Direction.

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*Lasers and Their Application:*

Fundamentals of Lasers, Solid State Lasers, Gas Laser, Semiconductor Lasers, Liquid Lasers, Laser Spectroscopy, Laser Communications.

*Electronics:*

Introduction, Temperature Measurement, Thermocouple, Thermistors, Integrated Circuit Temperature Sensors, Strain and Displacement LVDT, Strain Gauge Capacitance Transducers, Pressure Force and Velocity Transducers, Vacuum Gauges.

*Modern Physics:*

Atomic Structure, Mass-Energy Conversion Relation, Radioactivity, Alpha, Beta and Gamma Particles and their Properties, X-Rays, Characteristics and Applications of X-Rays.

*Acid Base Chemistry:*

pH, Acids and Bases, Equivalents and Normality, Solution of Multi-equilibrium Systems, Buffers, Acid Base Titration, Natural Buffering Waters from Carbon dioxide and related Compounds.

*Organic and Biochemistry:*

Carbon, Properties of Organic Compounds, Functional Groups, Aliphatic Compounds, Nitrogen - Containing Compounds, Aromatic Compounds, Compounds of Sulphur, Naturally occurring Organic Compounds, Glycolysis, Tricarboxylic Acid Cycle, Enzyme Kinetics.

*Chemistry of Cement:*

Concrete, Additives, Asphalts, Fibre (Geo Fibre), Glass Fibre.

*Engineering Materials:*

Steel and other Metals (Al, Cu, etc.), Polymers, and Timber

## **CE 01      ENGINEERING SURVEYING**

Introduction to land surveying, definitions, branches and their application. Instruments used.

*Techniques:*

Chain Surveying, Theodolite its Types, Use and Traversing and Triangulation, Tachometry, Plane Table Surveying. Two and three point problems, Computation of areas and volumes by various methods,

*Modern Methods in Surveying:*

Principles of EDM Operation, EDM Characteristics, Total Stations, Field procedures for Total Stations in Topographic Surveys, Construction layout using Total Stations.

*Levelling and Contouring:*

Reduction of levels, temporary and permanent adjustments of level, precise levelling. Methods and applications of contouring,

*Field Work:*

Horizontal and Vertical control, Construction Surveys, Rail Road, Pipelines and other infrastructures. Layout of buildings and structures.

*Hydrographic Surveys:*

Objectives of hydrographic survey and electronic charting, Vertical control, Depth and Tidal measurements, Position-fixing techniques, Sounding plan, Horizontal control, Processing.

*Surveying Drafting and Computations:*

Maps and Plans, Plotting, Contour Maps, Profiles, Cross- sections, Prismoidal formula, Computations of area and volumes by graphical analysis and use of surveying software.

*Control Surveys:*

Geodesy, UTM and other Map Projections, Coordinate Systems and Datum, Horizontal control techniques, Survey markers, Observations on Polaris, Computation technique for azimuth determination and Gyro-theodolite.

*Advanced Surveying Techniques:*

Resources of information, Photogrammetric Surveying, Introduction to Satellites and Imageries.

*Field Work:*

Highway and Railway Curves, Route surveys, Circular curves, Setting out circular curve by various methods, Compound curves, Reverse, Vertical, Parabolic curves, Design considerations, Spiral curves, Approximate solution for spiral problems, Super-elevation.

## **CE 02      MECHANICS OF SOLIDS**

*Simple Stress and Strain:*

Kinds of stresses and strains, Load Extension Diagrams for different Materials, Hook's Law, Moduli of elasticity, Lateral strain, Volumetric Strain, Poisson's Ratio, Temperature stresses and Compound bars.

*Stresses in Beams:*

Theory of simple bending, Moment of resistance and section modulus, Application of flexure formula, Shear Stresses in Beams, Shear Centre, Shear Flow, Unsymmetrical Bending.

*Column and Struts:*

Axially loaded columns, Euler's Treatment, Rankine Gordon Formula for short and intermediate columns, Slenderness Ratio.

*Circular Shafts:*

Theory of Torsion for solid and hollow circular shafts.

*Springs:*

Open coil springs, closed coil springs, leaf springs.

*Strain Energy:*

Strain Energy due to direct loads, force, bending moments and torque, Stresses due to impact loads.

## **CE 03      ANALYSIS OF DETERMINATE STRUCTURES**

*Introduction to structural analysis:*

Types of structures, structural idealisation and loads. Redundancy and stability of structures.

*Analysis of Determinate beams:*

Shear force and bending moment diagrams with various combinations of loads, Relationship between shear force and bending moment.

*Analysis of Determinate pin Jointed Structures:*

by method of joints, method of sections, method of moment and shears and graphical method.

*Analysis of Statically Determinate Rigid Jointed Plane Frames:*

Shear force, bending moment and axial force diagrams for these structures.

*Temperature stresses in structures.*

*Moving Loads:*

Influence lines for reactions, shear force and bending moment in statically determinate beams and panelled girders, influence lines for member forces in pin jointed frames, Calculation of maximum stress function (reaction, shear, bending moment, axial force) in these structures.

*Three Hinged Arches, Cables and Suspension Bridges:*

Basic considerations in analysis and design. Moving loads on three hinged arches and suspension bridge.

*Rotation and Deflection:*

Rotation and deflection of beams by moment area method, conjugate beam method, Castigliano's second theorem. Rotation and deflection of beams, plane trusses and frames. Principle of virtual Work, unit load method, graphical method. Three moment equation for analysis of statically indeterminate beams.

**CE 04      FLUID MECHANICS***Introduction:*

Solids and fluids (liquids and gases). Units and dimensions. Physical properties of fluids; density, specific weight, specific volume, specific gravity, surface tension, compressibility. Viscosity, units of viscosity, measurement of viscosity, Newton's equation of viscosity. Hydrostatics, kinematics, hydrodynamics, hydraulics.

*Fluid Statics:*

Pressure intensity and pressure head: pressure and specific weight relationship, absolute and gauge pressure, measurement of pressure, Piezo-meter, manometer, pressure transducers. Differential manometer and Borden gauge.

*Forces on Immersed Bodies:*

Forces on submerged planes and curved surfaces and their applications, *Drag and Lift forces*, buoyancy and floatation. Equilibrium of floating and submerged bodies.

*Fluid Kinematics:*

Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow. Pathline, streamlines and stream tubes. Velocity and discharge. Control volume, Equation of continuity for compressible and incompressible fluids.

*Hydrodynamics:*

Different forms of energy in a flowing liquid, head, Bernoulli's equation and its application, Energy line and Hydraulic Gradient Line, Introduction to density currents, free and forced vortex, Forces on pressure conduits, reducers and bends, stationary and moving blades, torques in rotating machines.

*Dimensional Analysis and Similitude:*

Definitions, geometric and other similarities, dimensionless numbers, prototype, model.

*Fluid Properties Measurement:*

Static pressure, Viscosity, velocity and flow measurement, Orifices and mouthpieces, weirs and notches, Venturimeter.

**CE 05      CIVIL ENGINEERING DRAWING & GRAPHICS***Computer Programming:*

Introduction to personal computer setup. Introduction to Operating systems, computer programming, Program structure and flow charts.

*Computer Languages:*

Arithmetic operations and functions, input/output statements, decision making statements and loop Functions and subroutines. Data and Data Files.

Fundamentals of Visual C++ Programming. Introduction to Visual C++. Programming of simple, and elementary civil engineering problems.

Use of web as an academic tool.

**Civil Drafting:**

Elements of architectural planning and design, conceptual, schematic and working drawings and details of residential, commercial, religious, recreational, industrial, clinical, hospital, and educational buildings, Details of doors, windows, staircases etc. Elements of structural drawing and detailing; preparation of foundation plan, structural framing, slab details, staircase details, water tanks, beam and column elevations and sections mostly pertaining to reinforced concrete structures. Details of steel roof truss, connection details and fabrication drawings. Plumbing and electrical detailing pertaining to small residential units.

**Computer Graphics:**

General and basic know how related to computer aided drafting, e.g. co-ordinate system, drawings setup procedure, basic draw commands, basic edit commands, Layers, creating text and defining styles options, block and drawing import/export options, Cross hatching, save and plot (2D) and isometric drawings.

## **CE 06          ENGINEERING MECHANICS**

*Basic Concepts:*

Concepts of space, time, mass, velocity, acceleration and force. SI and British Gravitational (BG –formerly FPS) units. Scalar and vector quantities, Newton's laws of motion, law of gravitation.

*System of Forces:*

Resultant and resolution of co-planer forces using parallelogram, triangle and polygon law and funicular polygon. Simple cases of resultant and resolution of forces in space. Conditions of equilibrium of co-planer forces, analytical and graphical formulations.

*Equilibrium of Rigid Bodies:*

Free body concept, conditions of support and attachment to other bodies, *Support Reactions*, Degree of restraint and static determinacy. Statically determinate problems especially of civil engineering importance, Equilibrium of two-force and three-force bodies.

*Kinetics:*

Work, energy and power. Virtual work formulation of equilibrium of coplanar force. Potential energy, energy criterion for equilibrium, stability of equilibrium, application to simple cases.

*Rigid Bodies:*

Geometrical properties of plane areas, first moment of area, centroid, second moment of area, principal axes, polar second moment of area and radius of gyration.

Friction, Coulomb's theory of friction. Problems involving friction on flat and curved surfaces.

## 5.2 MECHANICAL ENGINEERING

### HS 01 ENGLISH

*Report Writing:*

Technical Report Writing.

*Speeches:*

Preparation of Short Speeches for various occasions.

*Written Communication:*

Writing of Formal Letters and Applications, Drafting of Memorandums, Contracts, Advertisements and Tender Notices. Preparation of Minutes of Meeting. Writing Short Papers on Technical Subjects. Notes Taking.

*Oral Communication:*

Oral reporting. Conference Leading. Dictation, Interviewing.

*Précis Writing:*

Précis Writing.

*Essays:*

Essays on technical and non-technical subjects.

*Applied Grammar:*

General Rules for writing correct English, Punctuation, Study of words, Construction and improvement of Sentences. Vocabulary Learning and use of Dictionary.

### MS 01 CALCULUS

*Set and Functions:*

Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic, and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, DeMorgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.

*Propositional Logic:*

Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.

*Boolean Algebra:*

Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs.

*Complex Number:*

Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions)

*Differential Calculus:*

Differentiation and Successive differentiation and its application; Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series, Taylor and Maclaurin series, L'Hopital's rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints. Solution of non-linear equation, using Newton Raphson method.

*Integral Calculus:*

Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their identities, applications of integration. Centre of pressure and depth of centre of pressure.

*Solid Geometry:*

Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical).

## **MS 03      ORDINARY DIFFERENTIAL EQUATIONS & FOURIER SERIES**

*1<sup>st</sup> Order Differential Equations:*

Basic concept; Formation of differential equations and solution of differential equations by direct integration and by separating the variables; Homogenous equations and equations reducible to homogenous form; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations and orthogonal trajectories; Application in relevant Engineering.

*2<sup>nd</sup> and Higher Orders Equations:*

Special types of  $n^{\text{th}}$  order differential equations with constant coefficients and their solutions; The operator  $D$ ; Inverse operator  $1/D$ ; Solution of differential by operator  $D$  methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering.

*Partial Differential Equation*

Basic concepts and formation of partial differential equations; Linear homogenous partial differential equations and relations to ordinary differential equations; Solution of 1<sup>st</sup> order Linear and special types of second and higher order differential equations;  $D'$  Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution; Various standard forms.

*Laplace Integral & Transformation:*

Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the  $n$ th order derivative, initial and final value theorem, Laplace transform of integrals, Laplace transform of functions  $t^n F(t)$  and  $F(t)/t$ , Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms convolution theorem, solutions of ordinary differential using Laplace transform.

*Fourier series:*

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods. Odd and even functions and their Fourier series; Half range expansions of Fourier series, "DFT and FFT, Fourier Spectrum".

**ME 01 THERMODYNAMICS***Thermodynamic Properties:*

Introduction; Working substance; System; Pure substance; PVT surface; Phases; Properties and state; Units; Zeroth Law; Processes and cycles; Conservation of mass.

*Energy and its Conservation:*

Relation of mass and energy; Different forms of energy; Internal energy and enthalpy; Work; Generalized work equation Flow and non-flow processes; Closed systems; First Law of Thermodynamics; Open systems and steady flow, Energy equation for steady flow; System boundaries; Perpetual motion of the first kind.

*Energy and Property Relations:*

Thermodynamics equilibrium; Reversibility; specific heats and their relationship; entropy; Second Law of Thermodynamics; Property relation from energy equation; Frictional energy.

*Ideal Gas:*

Gas laws; Specific heats of an ideal gas; Dalton's Law of Partial Pressure; Third Law of Thermodynamics; Entropy of an ideal gas; Thermodynamic processes.

*Thermodynamic Cycles:*

Cycle work; Thermal efficiency and heat rate; Carnot cycle; Stirling cycle; Reversed and reversible cycles; most efficient engine.

*Consequences of the Second Law:*

Calusius's inequality; Availability and irreversibility; Steady flow system.

*Two-Phase Systems:*

Two-phase system of a pure substance; Changes of phase at constant pressure; Steam tables; Superheated steam; Compressed liquid; Liquid and vapour curves; Phase diagrams; Phase roles; Processes of vapours; Mollier diagram; Ranking cycle; Boilers and ancillary equipment.

*Internal Combustion Engines:*

Otto cycle; Diesel cycle; Dual combustion cycle; Four stroke and two-stroke engines; Types of fuels.

*Reciprocating Compressors:*

Condition for minimum work; Isothermal efficiency; Volumetric efficiency; Multi-stage compression; Energy balance for a two-stage machine with inter-cooler.

**ME 02      SOLID MECHANICS***Statically Determinate Frames and Beams:*

Free-body diagrams; Determination of forces in frames; Shear force and bending moment diagrams; Relationships between loading shear force and bending moment.

*Statically Determinate Stress Systems:*

Stress; Direct, shear, hydrostatic and complementary shear stresses; Bar and strut or column; Thin ring or cylinder rotating; Stresses in thin shells due to pressure or self-weight.

*Stress-Strain Relation:*

Deformation; strain; elastic stress-strain behaviour of materials; Poisson's ratio; elementary thermal stress and strain; General stress-method.

*Statically Indeterminate Stress Systems:*

Interaction of different materials; Interaction of different stiffness components; Restraint of thermal strain; Volume changes; constrained materials.

*Bending Stresses:*

Simple bending theory; General case of bending; Composite Beams; Eccentric and load; Shear stresses in bending.

*Bending-Slope and Deflection:*

Equation of the deflection curve of the neutral axis; Double integration method; Method of super-position.

*Theory of Torsion:*

Torsion of thin-walled cylinder; Torsion of a solid circular shaft; Hollow shafts.

*Theories of Yielding:*

Thin Plates and Shells, Stress Concentration.

**ME 03      MATERIALS & MANUFACTURING PROCESSES***Introduction to Materials:*

Properties of metals and alloys (physical and mechanical), single crystal and poly-crystalline metals, crystal defects and the mechanisms of deformation and fracture, structural aspects of solidification & solid phase transformations in binary systems, ferrous and non-ferrous metals, various heat treatments, TTT- diagram.

*Polymers & Composites Materials:*

Polymerization, Thermoplastic Polymers, Thermo-setting Polymers, Additives. Introduction to composite materials, types of composite materials, property averaging, major mechanical properties.

*Sand Casting:*

Sand casting procedures; Patter making; Material types and construction of patterns; Pattern allowances; Moulding process; Moulding materials; Testing of sand; Moulding machines; Core making; Types of cores; Core making machines; Shell Moulding; Plaster Moulding; Centrifugal casting; Inspection of castings and defects.

*Die Casting:*

Pressure die casting; Vacuum die casting; Gravity die casting; Die casting machines; Hot chamber and Cold Chamber methods; Die casting alloys.

*Fabrication of Plastics:*

Casting; Blow Moulding; Compression Moulding; Transfer Moulding; Cold Moulding; Injection Moulding; Reaction Injection Moulding; Vacuum forming; Welding of plastics.

*Welding Processes:*

Classification of welding processes; Oxyacetylene welding, Arc welding; Shielded arc welding, Gas tungsten arc welding, Gas metal arc welding, Flux-cored arc welding, submerged arc welding, plasma arc welding, Spot, Seam & Projection welding. Brazing and Soldering.

*Machining Processes and Machine Tools:*

Machine tools using single edge cutting tools, and multiple edge cutting tools; Description, and operations; performed on lathe, shaper, Planner, drilling, milling, gear cutting, and broaching machines. Work holding devices.

Machine tools using abrasive wheels; description and functions of various types of grinding machines; wheel dressing, and wheel balancing; Honing, lapping, and super finishing operations.

Cutting tools for manufacturing: Cutting tool material characteristics; Cutting tool materials; Tool Geometry; Non-traditional machining processes such as EDM, ECM, & ultrasonic machining.

*Hot & Cold Working of Metals:*

Advantages and limitations of Hot working and Cold working processes; Methods of Forging; Hammer forging; Die forging; Drop, Press and Upset forging; Forging defects and their causes. Cold working processes such as Bending, Shearing, Rolling, Extrusion, Blanking, Tube drawing and Wire drawing.

**ME 04 FLUID MECHANICS***Properties of Liquids and Gases:*

Ideal and real fluids; Properties and gases; Viscosity and compressibility of fluids; Fluid pressure.

*Fluid Statics (Equilibrium):*

Euler's conditions of equilibrium; Pressure in a fluid under the action of gravity; Homogeneous fluid; Several fluids of different specific weights; Interconnected vessels; Constant-velocity rotation of a liquid around-fixed axis; Fluid under pressure neglecting gravity; Force on container wall; Force on flat surfaces; Force on curved surfaces; Buoyancy of fluid at rest; Stability of a floating body; Surface tension and capillary tubes.

Atmospheric equilibrium; Isothermal state; Adiabatic state; The standard atmosphere.

*Fluid Dynamics:*

One-Dimensional inviscid flow (flow filament theory); Equation of continuity; Euler's equations of motion; Bernoulli's equation; Impulse and momentum. One dimensional viscous flow; Generalized Bernoulli's equation; Laminar and turbulent flow in circular pipes; Pipe flow problems; Flow in open channels.

*Dimensional Analysis:*

Buckingham-Pi Theorem; Reynolds' laws of similitude.

*Fluid Measurements:*

Measurement of static pressure; Stagnation pressure, flow velocity and flow rate.

**ME 05      ELEMENTS OF MACHINE DYNAMICS AND DESIGN**

*Machine Dynamics:*

Linkages; Cams; Friction clutches; Brakes and dynamometers; Belt and chain drives; Gear Trains including Epicyclic; couplings for non coaxial shafts; Steering gears; Turning-moment diagrams; balancing of rotating and reciprocating masses.

*Principle of Design:*

Mechanical properties of materials; Elasticity; Plasticity; Modules of resilience; Endurance limits Hardness; Creep; Effect of stress concentration; Wear.

Analysis of operating conditions; Deflection; Torsion; Shear Centre; Thermal Stresses Energy Methods: Composite section; closed and open type; Simple framed structure.

Theories of failures including fatigue failure and Soderberg criterion.

*Introduction to Design of Simple Machine Elements:*

Shaft Materials; Shafts operating under combined loading; Introduction to fluting loads with particular reference to industrial codes of practice such as BSS or DIN or JIS or COST.

Bearings; Methods of Lubrication; Bearing materials; Design of journal bearing; Introduction to design of ball and roller bearings.

Joints; Knuckle, cotter and universal joints; Couplings; Universal, Flanged, flexible, Clutches; Friction and mechanical type.

Springs; Helical and leaf type.

*Working of Torsion:*

Torsion of thin walled cylinder, Torsion of a solid circular shaft, Hollow circular shafts, Non-Uniform and composite shafts, Tapered shaft.

*Theory of Columns:*

Euler's theory of buckling for an eccentric loading of long columns; Behaviour of ideal and real struts.

*Governors and Gyroscopes:*

Function, Principle of operations, applications.

Function of gyroscopes, gyroscopic acceleration and couple, application of gyroscopes.

**ME 06      COMPUTER PROGRAMMING & DRAFTING**

*Introduction:*

Introduction to programming concepts & languages, Compilation & Interpretation of modular programming, ASCII character set.

*Building Blocks:*

Identifiers and keywords, data-types, Variables and Constants, Statements and Operators, Input and Output Functions.

*Branching Statements:*

Conditional branching and Looping (Counter and condition controlled loops).

*Subroutines:*

A brief overview, Defining a subroutine, Accessing a subroutine, Passing arguments, Returning values and Recursion.

*Arrays & Strings:*

Defining an array, Referring to individual elements of an array, Processing an array, Multidimensional arrays, String handling and Manipulation, Overview of pointers.

*Computer Aided Drafting:*

Introduction, Application of computers in drafting and designing, Methods for creating drawing entities, Common editing features, Dimensioning with variable setting, Printing & Plotting.

**ME 07**

**ENGINEERING MECHANICS**

*Statics of Particles:*

Forces in a plane; Newton's First Law, Free body diagram; Forces in space (rectangular components); Equilibrium of a particle in space.

*Kinematics of Particles:*

Rectilinear and curvilinear motion of particles; Components of velocity and acceleration; Motion relative to a frame in translation.

*Kinetics of Particles:*

Newton's Second Law; Dynamic equilibrium; Rectilinear and curvilinear motion; Work and energy; Kinetic energy of particle; Principle of Work and Energy; Conservation of energy; Impulse and momentum; Impulsive forces and conservation of momentum; Impact, direct and oblique; Conservation of angular momentum.

*Rigid Bodies:*

Equivalent systems of forces; Principle of transmissibility; Moment of a force; Couple; Varignon's Theorem. Centre of gravity of a three-dimensional body and centroid of a volume. Moments of inertia, radius of gyration, parallel axis theorem.

*Equilibrium of Rigid Bodies:*

Free-body diagram; Equilibrium in two and three dimensions; Reaction of supports and connections; Equilibrium of two-force and three-force bodies.

*Kinematics of Rigid Bodies:*

General Plane motions; Absolute and relative velocity and acceleration.

*Plane Motion of Rigid Bodies:*

Forces and acceleration; Energy and momentum; Conservation of linear and angular momentum.

*Friction:*

Laws of dry friction; Angles of friction; Wedges; Square-threaded screws; Journal and thrust bearings; Belt friction.

*Analysis of Structures:*

Internal forces and Newton's Third Law; Simple and space trusses; Joints and sections; Frames and machines. Forces in cables.

## 5.3 ELECTRICAL ENGINEERING

### HS 01 ENGLISH

#### *Report Writing:*

Technical Report Writing.

#### *Speeches:*

Preparation of Short Speeches for various occasions.

#### *Written Communication:*

Writing of Formal Letters and Applications, Drafting of Memorandums, Contracts, Advertisements and Tender Notices. Preparation of Minutes of Meeting. Writing Short Papers on Technical Subjects. Notes Taking.

#### *Oral Communication:*

Oral reporting. Conference Leading. Dictation, Interviewing.

#### *Précis Writing:*

Précis Writing.

#### *Essays:*

Essays on technical and non-technical subjects.

#### *Applied Grammar:*

General Rules for writing correct English, Punctuation, Study of words, Construction and improvement of Sentences. Vocabulary Learning and use of Dictionary.

### MS 01 CALCULUS

#### *Set and Functions:*

Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic, and rational inequalities in involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, DeMorgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.

#### *Propositional Logic:*

Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.

#### *Boolean Algebra:*

Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs.

*Complex Number:*

Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions)

*Differential Calculus:*

Differentiation and Successive differentiation and its application; Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series, Taylor and Maclaurin series, L'Hopital's rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints. Solution of non-linear equation, using Newton Raphson method.

*Integral Calculus:*

Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their identities, applications of integration. Centre of pressure and depth of centre of pressure.

*Solid Geometry:*

Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical).

**MS 04      COMPLEX VARIABLE & FOURIER ANALYSIS***Infinite Series:*

Application of convergence tests such as comparison, Root, Ratio, Raabe's and Gauss tests on the behaviour of series.

*Complex Variable:*

Limit, continuity, zeros and poles of a complex function. Cauchy-Reimann equations, conformal transformation, contour integration.

*Laplace Integral & Transformation:*

Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals, Laplace transform of functions  $t^n F(t)$  and  $F(t)/t$ , Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential and partial differential equations using Laplace transform (I.V.P's & B.V.P's). Z and Inverse Z – transformations, properties of Z – transformation and applications.

*Fourier series:*

Introduction to fourier series, Euler fourier formulae, even and odd functions, application of fourier series, Fourier transform and fast fourier transform and properties with applications.

## **EE 01      BASIC ELECTRICAL ENGINEERING**

### *Electrical Elements and Circuits:*

Energy and energy transfer, Electric Charge, Electric current, potential difference and voltage, Electric power and energy, Electric circuit sources and elements, resistance, Ohm's law, Inductance, capacitance, fundamental circuit laws, Kirchhoff's Laws, direct application of fundamental laws to simple resistive networks, introduction to node voltage and loop current methods.

### *Steady State AC Circuits:*

An introduction to periodic functions, RMS or effective Average and maximum values of current and voltage for sinusoidal signal wave forms. The Phasor method of analysis an introduction, application of phasor methods to simple AC circuits, power and reactive power, maximum power conditions.

### *Magnetic Circuits and Transformers:*

Magnetic effects of electric current, magnetic circuit concepts, magnetization curves, characteristics of magnetic materials, magnetic circuits with DC excitation, magnetically induced voltages, self inductance magnetic circuits with AC excitation, hysteresis and eddy current losses, introduction to transformer, The ideal transformer.

### *Electromechanical Energy Conversion:*

Basic principles, Generated voltage, Electromagnetic torque, Interaction of magnetic fields, alternating current generators, commutator actions, DC machine, direct current generators, electric motors, losses and efficiency, Machine application considerations.

### *Electronic Devices:*

The nature of Electronics, electron devices, semiconductors, charge flow processes, junction diode, characteristics of junction transistors, biasing of junction transistors, rectification, half wave and full wave rectifiers simple treatment, elementary concept of amplification with transistor used as amplifier in common emitter configuration.

## **EE 02      CIRCUIT THEORY**

### *Introduction to Circuit Concepts:*

Basic two terminal circuit elements, Linear time invariant resistor, Linear time invariant capacitor, Linear time invariant inductor, energy concepts in two terminal elements, energy dissipated in a resistor, energy stored in an inductor and capacitor, ideal independent voltage and current sources.

### *Kirchhoff's Law:*

Basic definitions of branch, loop and node, statements of Kirchhoff's voltage and current laws, linearly independent KCL and KVL, equation of KVL and KCL laws, series and parallel conceptions of two terminal one port circuit elements. Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and Reciprocity theorem.

### *Elementary Transient Analysis:*

Differential and integral forms of circuit equation, Initial voltage on a capacitor, initial current in an inductor, first order circuits, solution of single first order differential equations, particular and total solution of second order linear time invariant differential equations.

### *Sinusoidal Steady State Analysis:*

Network response to sinusoidal driving functions, complex impedance and admittance functions, development of concept of phasors, power consideration, complex power, maximum power transfer, tuned circuits, series and parallel RLC tuned circuits, definition of quality factor.

*Exponential excitation and Transformed Network:*

Representation of excitations by exponential functions, single element responses, forced response with exponential excitation, introduction to the transformed network, driving point impedance and admittance.

*Non-sinusoidal Periodic Analysis:*

Fourier Series and its use in Circuit Analysis, Evaluation of Fourier Coefficients, Waveform symmetries, exponential form of Fourier series, Steady state response to periodic signals.

*Magnetically Coupled Circuits:*

Mutual inductance, Dot conventions, energy considerations, the linear transformer and ideal transformer.

**EE 03          ELECTRONIC DEVICES AND CIRCUITS**

Ideal diode, terminal characteristics, small signal model, analysis of diode circuits, applications. The bipolar junction transistor structure, transistor as amplifier, transistor biasing, small signal models, single stage BJT amplifier configurations, single stage mid frequency amplifier, analysis and design, feedback in amplifiers, multi stage amplifier, high frequency response of single stage amplifier, Bipolar transistor as switch, structure and physical operation of MOSFET, current-voltage characteristics of MOSFET, The depletion type MOSFET. The junction field effect transistor, FET circuits at DC, FET biasing, FET as amplifier and basic configurations of single stage amplifiers, frequency response of common source amplifier, FET switches.

**EE 04          ELECTRICAL MACHINES***DC Machines:*

Construction, Simple lap and wave windings, equalizing connections and dummy coils, elementary concept of armature reaction and commutation, Cross and demagnetising ampere turns. DC Generators, Types, emf equation, Losses, Efficiency, Performance curves, characteristics, Critical resistance and speed and effect of armature reaction of OCC, Internal and external characteristics from OCC neglecting and accounting armature reaction. Calculation of series ampere turns for level and over compounding. Motors, Principle, Back EMF, Torque, speed and speed regulation. Types, characteristics, performance curves, losses and efficiency. Speed and torque problems involving magnetisation curve, charging and ignition circuits of automobiles.

*AC Synchronous Machines:*

Construction, stator single layer, double layer and concentric windings, damping windings. Coil span factor, distribution factor, leakage and armature reaction, synchronous impedance. Alternators, types, emf equation, speed and frequency, losses and efficiency, alternator on load, voltage regulation by synchronous impedance method. Synchronous Motors, types, principle of working, Vector diagram on load and its analysis for stator current, power factor, torque and mechanical output, Effect of Variation and excitation, Losses and efficiency.

*AC Induction Machines:*

Induction Motors, Construction, Types, Rotating field theory, principle of working, slip and its effect on motor current quantities. Losses, efficiency and performance curves. Starting, full load and maximum torque relations, torque slip characteristics.

*Transformers:*

Construction, principle of working, Emf equation, Transformation ratios, No load working and vector diagram, magnetising current, Vector diagram on load, Equivalent circuit, Open circuit and short circuit tests, losses, efficiency and performance curves, all day efficiency, Percentage and per unit R, X and Z. Voltage regulation and Kapp's regulation diagram. Transformer as a mutually inductive circuit.

*Magnetic Circuit of the DC Machine:*

Laws, Units, MMF, Permeability, Magnetization curves, magnetic circuit of DC machine, flux distribution, field form, effect of saturation, reluctance of airgap with slotted armatures, with ventilation ducts, ampere turn calculations for air gap, teeth armature core, pole and yoke.

*DC Motors:*

Characteristics of series, shunt and compound motors, starters, calculation of starter step resistance by analytical and graphical methods for shunt and series motors.

*Speed Control of DC Motors:*

Speed control methods for series, shunt and compound motors, series parallel control for traction motors, Multivoltage control, regulex control, plugging dynamic braking, testing efficiency and temperature rise, losses determination of losses, direct and indirect test, estimation of temperature rise of armature commutator and field winding, efficiency.

**EE 05            PROGRAMMING WITH C-LANGUAGE***The Turbo C Programming environment:*

Setting up the Integrated Development Environment, File used in C program Development, using the Integrated Development Environment, the Basic Structure of C programs, Explaining the printf Function.

*C Building Blocks:*

Variables, Input/ Output, Operators, Comments.

*Loops:*

The for Loop, The while loop, The do while loop.

*Decisions:*

The if statement, the if-else statement: the else-if construct. The switch statement, the Conditional operator.

*Functions:*

Simple Functions, Functions that return a value, using arguments to pass data to a function, using more than one functions, external variables, prototype versus classical K and R, Preprocessor directives.

*Arrays and Strings:*

Arrays, Referring to individual Elements of the Array, String.

*Pointers:*

Pointer Overview, Returning data from functions, pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers. Structures, unions, and ROM BIOS.

*Turbo C Graphics Functions:*

Text-mode Functions Graphics - Mode Functions. Text with Graphics.

*Files:*

Types of Disk I/O, Standard, Input/ Output Binary Mode and Text mode, Record, Input/ Output, Random Access, Error Conditions, System-Level Input/ Output, Redirection.

*Advanced Variables:*

Storage Classes, Enumerated data type, Renaming data type with typedef, Identifiers and Naming classes, type conversion and casting, labels and goto statement.

*C++ and Object Oriented Programming:*

Object Oriented Programming, some useful C++ features classes and objects, constructors and memory Allocations, Inheritance, Function Overloading, Operator Overloading.

**EE 06        ELECTROMAGNETIC FIELDS***Vector Analysis:*

Scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vectorfield, the dot product the cross product, other coordinate systems, circular cylindrical coordinates, the spherical coordinate system, transformations between coordinate systems.

*Coulomb's Law and Electric Field Intensity:*

The experimental law of coulomb, Electric field intensity, field of a point charge, field due to a continuous volume charge distribution, field of a line charge, field of a sheet of a charge, stream-lines and sketches of fields.

*Electric Flux Density Gauss's Law and Divergence:*

Electric flux density, Gauss's law, application of Gauss's law, some symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation, electrostatics, the vector operator and the divergence theorem.

*Energy and Potential:*

Energy expended in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole, Energy density in the electrostatic field.

*Conductor Dielectrics and Capacitances:*

Current and current density continuity of current metallic conductors, conductor properties and bounded conditions, semi conductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines. Curvilinear square, physical modules, current analogies, fluid flow maps the iteration method.

*Poisson's and Laplace's Equations:*

Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation, examples of the solution of poisson, product solution of Laplace's equation.

*The Steady Magnetic Field:*

Biot Savart's Law, Amperes circuit law, curl, stoke's theorem, Magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivation of steady magnetic field laws.

*Magnetic Forces Materials and Inductance:*

Force on a moving charge, force on a differential current element, force between differential current element, force and torque on a closed circuit, the nature of magnetic materials, Magnetisation and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance.

*Time Varying fields and Maxwell's Equations:*

Faraday's Law, displacement current, Maxwell's equation in point form, Maxwell's equation in integral form, the retarded potentials.

*The Uniform Plane Wave:*

Wave motion in free space, wave motion in perfect dielectric, plane waves in loose dielectrics. The Pointing vector and power considerations, propagation in good conductors, skin effect, reflection of uniform plane waves standing wave ratio.

## **EE 07      LOGIC DESIGN AND COMPUTER ARCHITECTURE**

*Logic Design:*

Number Systems & Truth Function, Conversion between different base numbers, Binary connectives, evaluation of truth functions, Physical realizations.

Boolean Algebra & Switching Devices, Truth functional calculus as Boolean algebra, duality, fundamental theorems of Boolean algebra, examples of Boolean simplifications, Switches and relays, logic circuits, speed and delays in logic circuits, integrated logic circuits.

Minimisation of Boolean Functions, Standard form of Boolean function, Minterm and maxterm, Karnaugh map representation of Boolean functions, simplification of functions on Karnaugh maps, map minimization of product of sums expressions, incompletely specified functions.

Introduction to Sequential Networks, Latches, Sequential Networks in fundamental mode, Introduction to the Synthesis Sequential Networks, Minimisation of the number of states, Clocked Networks.

*Computer Architecture:*

Historical Developments, Evolution of Computers, Architecture and Organization, High-Level & Assembly Language Programming, Machine Language, Role of Operating System, Computer Structures.

Internal Memory, Semiconductor Main Memory, Cache Memory, External Memory, Bus Structures.

External Devices I/O Modules, Programmed I/O, Interrupt-Driven I/O, DMA, I/O Channels and Processing, the External Interface, SCSI and FireWire.

ALU, Integer Representation, Integer Arithmetic, Floating-Point Representation, Floating-Point Arithmetic, Types of Operands and Operation, Addressing Modes, Instruction Formats.

**The Competent Authority  
reserves the right to make any  
changes in this Prospectus  
without any prior notice.**