MTH 111.3 Engineering Mathematics I (3-2-0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:
After the completion of this course prospective engineers will be able to apply the concepts of calculus, analytic geometry and vectors in their professional courses.

Course Contents:

1. **Differential Calculus** **(15 hrs)**
   Review of sets and functions, limit, continuity and differentiability of functions, higher order derivative, Leibnitz rule and its application, Rolle's theorem, Lagrange's and Cauchy mean value theorems, maxima and minima of a function of a single variable, indeterminate form and L-Hospitals rule, curvature, asymptotes and curve tracing.

2. **Integral Calculus** **(15 hrs)**
   Review of techniques of integration (method of Substitution, integration by parts, special trigonometric forms and rational functions) standard integrals, definition and properties of definite integrals (area, arc length, volume and surfaces areas of revolution), Simpson's rule, trapezoidal rule and use of Popus theorem, moments of inertia and centroid.

3. **Analytic Geometry and Vector Algebra** **(15 hrs)**
   Review of vectors and scalars, resolution of vectors, scalar, scalar and vector product of two and more vectors, vectorequation of lines and planes, transformation of axes, parabola, ellipse, hyperbola and polar equation of conics.

Textbook:

1. Thomas and Finney, *Calculus and Analytic Geometry*, Narosa Publishing House, New Delhi.

Reference Books:

1. M.B. Simgh and B.C. Bajracharya, *A Text Book of Vector Analysis*, Sukunda Pustak Bhawan, Bhotahity, Kathmandu
2. M.B. Singh and B.C. Bajracharya, *Differential Calculus*, Sukunda Pustak Bhawan, Bhotahity, Kathmandu
3. Lalji Prasad, *Higher Co-ordinate Geometry*, Para Mount Publication, Patna-4

CMP 103.3 Programming in C (3-0-3)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The object of this course is to acquaint the students with the basic principles of programming and development of software systems. It encompasses the use of programming systems to achieve specified goals, identification of useful programming abstractions or paradigms, the development of formal models of programs, the formalization of programming language semantics, the specification of program, the verification of programs, etc. the thrust is to identify and clarify concepts that apply in many programming contexts:

Course Contents:

4. Introduction (4 hrs)

History of computing and computers, Text editing and file concepts, Traditional and structured programming concept, Problems analysis, flow chart and algorithm, Program Documentation

5. Variables and data types (3 hrs)

Constants and variables, Variable declaration, Variable Types, Simple input/output function, Operators

6. Loops and Decisions (5 hrs)

Introduction, For Loop, While Loop, Do while Loop, Nested Loop, Case, break and continue statements, The if, if else, else-if and switch statements.

7. Functions (6 hrs)

Introduction, Returning a value from a function, Sending a value to a function, Arguments, External variables, Preprocessor directives, C libraries, Macros, Header files and prototyping

8. Arrays and Strings (9 hrs)

Introduction to Arrays, Initializing Arrays, Multidimensional Arrays, String, Functions related to the strings, Function related to Graphics

9. Pointers (10 hrs)

Pointers definition, Pointers and Arrays, Returning multiple values from functions, using pointers, Pointer Arithmetic, Pointer and Strings, Double Indirection, Pointer to Arrays

10. **Structure and Unions (5 hrs)**

Definition of Structure, Nested type Structure, Arrays of Structure, Structure and Pointers, Unions

11. Files and File Handling (3 hrs)

Operating a file in different modes (Real, Write, Append), Creating a file in different modes (Read, Write, Append)

Laboratory:

Laboratory work at an initial stage will emphasize on the verification of programming concepts learned in class and use of loops, functions, pointers, structures and unions. Final project of 10 credit hours will be assigned to the students which will help students to put together most of the programming concepts developed in earlier exercises.

Textbooks:

2. A book on C by A1 Kely and Ira Pohl
3. The C Programming Language by Kerighan, Brain and Dennis Ritchie

MEC 178.1 Mechanical Workshop (0-0-3)

Evaluation:

	Theory	Practical	Total
Sessional	-	100	100
Final	-	-	-
Total	-	100	100

Course Objectives:

To provide instructions and practical experience in basic mechanical workshop methods.

Course Contents:

12. Mechanical Workshop Materials (4 hrs)

Introduction to mechanical workshop, Basics of steel and cutting materials, Common non-ferrous metals, Important mechanical properties.

13. Measurement and Measuring Equipment (1.5 hrs)

14. Bench Tools and Basic Hand Operations (1.5 hrs)

Filing, Sawing, Sheet metal working, screw thread and screw thread cutting

15. Joining Processes (1.5 hrs)
Riveting, Soldering, Brazing, Welding

16. Introduction to Machine Tools (1.5 hrs)
Elements of machine tools, Cutting actions and tooling

17. Familiarization with Basic Machine Tools (5 hrs)
Lathe, Milling machine, Drill presses, Power saws, Shaping Machine and Grinding machines

Practical:

1. To convert a metallic job piece into a prescribed form using mechanical bench tool.
2. To turn a cylindrical job piece to prescribed dimension by using lathe machine.
3. To convert a metallic job piece to prescribed dimension by using milling machine.
4. To provide surface finish to a metallic piece by using the shaper machine.
5. To weld required metallic pieces together by using electric arc and gas welding, to given shape and size.
6. To make knot & bolt of given size and type
7. To make tray/dust bin/ pen holder or similar item with sheet metal.

Textbook:

4. Pradhan I. M., *Course Manual on Workshop Technology*, **nec** Publication.

Reference Books:

1. Anderson and E.E. Tatro, *Shop Theory*, McGraw-Hill 5th edition, 1942.
2. Lascoe, C.A. Nelson and H.W. Porter, *Machine Shop Operation and Setups*, American Technical Society, 1973.
3. *Machine Shop Practice – Volume II*, Industrial Press, New York, 1971.
4. Oswald, *Technology for Machine Tools*, McGraw-Hill Ryerson, 3rd edition.
5. Oberg, Jones and Gorton, *Machinery's Handbook*, 23rd edition, Industrial Press, New York

ENG 104.2 Communication Technique (2-2-1)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

The main objectives of this course are:

2. To develop the ability to deliver technical knowledge orally in English.
3. To be able to comprehend and take notes after listening.
4. To fasten reading skills in technical and non-technical reading materials.
5. To develop summarizing skills in writings.
6. To write reports, letters, description on technical talks, seminar papers, memoranda, application and tender notices.

Course Contents:

18. Review of Written English (1 hrs)

Sentence structure (identification of sentence or its types and transformation of sentences).

19. Oral Communication and Note Taking (12 hrs)

Types of English (Variety levels of English), Technical talk (Environmental Pollution, Construction, Water resources, Impact of computer in modern society, Impact of satellite communication, urban development).

20. Technical Writing Skills (6 hrs)

Preparation of short memoranda (Importance-formats), Business letters (Importance-purposes), Preparation of application (Job application-biodata), Description writing (Process, Mechanism, Place etc.), Seminar papers (Conduction of seminar, Preparation of circular, Presenting seminar paper), Preparation of proposals (Importance-types-formats), Preparation of reports (Importance-types-formats)

21. Reading Skills (11 hrs)

Comprehension questions and exercises (fro prescribed passages-Freedom, Kinship and the family, Marconi and the invention of Radio, R foundation, The turbo-prop engine, The use and misuse of Science and grief), Outlining or note making from any passages, Precis writing from any passages. Knowledge and Wisdom, Beauty and Custom

Laboratory Work:

1. To familiarize the students with the audio-visual equipment. (Overhead projector, slide projector, dictaphone).
2. To watch the visual cassettes and to get familiarized with the language (follow me – I).
3. To watch the visual cassettes and to get familiarized with the language (follow me – II)
4. Some general rules of pronunciation.
5. Word accent in English.
6. Attributes of good English.
7. To present a seminar paper.
8. To participate in a group discussion.
9. To conduct a meeting.
10. To prepare and practice to face an interview.

Textbook:

5. Andrea J. Rutherford. *Basic Communication Skills for Technology*. 2nd Edition. Addision Wesley. Pearson Education Asia (LPE) ISBN: 8178082810

Reference Books:

6. Anne Eisenberg, *Effective Technical Communication*, Mc-Graw Hill 1982.
7. Houp and T.E. Pearsall, *Reporting Technical Information*, Allyn and Bacon, Boston.
8. V.R. Narayanaswami, *Strengthen your writing*, Orient Longman, Madras.
9. Champa Tickoo & Jaya Sasikumar, *Writing with a Purpose*, Oxford University Press, Bombay.
10. A handbook of pronunciation of English words (with 90-minute audio cassettes) Communication Skills in English.

ELE 105.3 Basic Electrical Engineering (3-1-2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

7. To analyze electric circuits (A.C. & D. C).
8. To work on electrical instrumentation projects.
9. To operate, distinguish and use electrical devices and machines.

Course Contents:

22. Network Theory (10 hrs)

Circuit concepts (lumped and distributed parameters, Linear and non-linear parameters, passive and active circuits), Circuit elements (RLC) and their characteristics, Star-delta transformation, Ideal and non-ideal sources, Dependent and independent sources, Kirchhoff's current and voltage laws, Voltage divider and current divider formula. Nodal Method and Mesh method of network analysis, Network theorems (Thevenin's Norton's, Superposition, Maximum power transfer)

23. AC Circuit Analysis (14 hrs)

Generation of alternating voltage Sinusoidal Functions- terminology, Average value and RMS or effective value of any type of alternating voltage or current waveform, Phasor algebra, Steady state response of circuits concept of Admittance, Reactance, Instantaneous power, Average real-power, Reactive power, Power factor and significance of power factor, Resonance in series and parallel RLC circuits, Bandwidth, Effect of Q-factor in resonance, Concept of a balanced three phase supply, Advantages of 3-phase system, Star & delta connected supply and load circuits, Line and Phase voltages/ current relations, Concept of three phase power and its measurement by two wattmeter method.

24. Basic Instrumentation (5 hrs)

Classification and basic requirements. Moving iron, Moving coil and induction type ammeters and voltmeters, Dynamometers, single phase energy meter

25. Devices and Machines (16 hrs)

Magnetic circuits, Analogy with electric circuits, Calculations of magnetic circuits, Hysteresis and eddy-current effects in ferromagnetic materials.

Single phase transformers, Principle of Operation, Constructional features, Equivalent circuit and phasor diagram, Efficiency and regulation, Testing of transformers (O.C. and S.C. tests).

Electromechanical energy-conversion principles, Construction features of rotating electric machines, Generation of emf and torque, Elementary principles of three phase synchronous generator.

D.C. Machines, Performance and operation, types of excitation, brief explanation of armature reaction and communication, Characteristics of motors and generators, Starting, Speed control and selection of motors.

Three phase induction motors, Principle of operation, Characteristics starting and speed control, Introduction to single phase induction motor.

Laboratory Work:

1. To measure current, voltage and power across the passive components.

2. To verify Kirchhoff's Current Law (KCL) & Kirchhoff's Voltage Law (KVL)
3. To verify Thevenin's Theorem.
4. To verify maximum power transfer theorem.
5. To verify superposition theorem.
6. To measure three phase power by using two wattmeter.
7. To determine efficiency and voltage regulation of a single-phase transformer by direct loading.
8. To study open circuits & short circuits tests on a single phase transformer.
9. To study the speed control of dc shunt motor by.
    i. Varying the field current with armature voltage held constant field control.
    ii. Varying the armature voltage with field current held constant armature control.
10. To study open circuits and load test on a dc shunt generator (separately excited)
    i. To determine magnetization characteristics
    ii. To determine V-I characteristics of a dc shunt generator.

Textbook:

6. S.N. Tiwari and A.S. Gin Saroor, *A First Course in Electrical Engineering,* A. H. Wheeler and Co. Ltd., Allahabad, India

Reference Books:

11. B.L. Theraja and A.K. Theraja, *A Text Book of Electrical Technology*, S. Chand and Company Ltd., New Delhi, India.
12. V. Del Toro, *Principles of Electrical Engineering*, Prentice Hall of India, Ltd. New Delhi.
13. I.J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, New Delhi.
14. P.S. Bhimbra, *Electric Machinery*, Khanna Publishers, New Delhi.

MEC 109.1 Engineering Drawing (0-0-5)

Evaluation:

	Theory	Practical	Total
Sessional	-	100	100
Final	-	-	-
Total	-	100	100

Course Objectives:

1. To develop sketching, lettering and drafting skills
2. To draw projections, drawings of various geometric figures.
3. To draw assembly of machine parts.
4. To develop ability of preparing working drawings

Course Contents:

1. Instrumental Drawing, Practices and Techniques (10 hrs)

Equipment and metals, Description of drawing instruments, auxiliary equipment and drawing materials, Techniques of instrument drawing, pencil sharpening, securing paper, proper use of T-squares, triangles, scales, dividers, compasses, erasing shields, French curves, inking pens.

Freehand Technical Lettering

Lettering strokes, letter proportions, use of pencils and pens, uniformity and appearance of letters, freehand techniques, inclined and vertical letters and numerals, upper and lower cases, standard English lettering forms.

Dimensioning

Fundamentals and Techniques: size and location dimensioning, IS conversion; Use of scales, measurement units, reducing and enlarging drawings; General dimensioning practices: placement of dimensions aligned and unidirectional recommended practice, some 50 items.

2. Applied Geometry (20 hrs)

Plane geometrical construction: Bisecting and trisecting lines and angles, proportional division of lines, construction of angles, triangles, squares, polygons, constructions using tangents and circular archs. Methods of drawing standard curves such as ellipse, parabolas, hyperbolas, involutes, spirals, cycloid and helices (cylindrical and helical); Solid geometrical construction: Classification and pictorial representation of solid regular objects such as: prisms, square, cubical, triangular and oblique, Cylinders: right and oblique, Cones: right and oblique, Pyramids: square, triangular, oblique, truncated; Doubly-curved and warped surfaces: Sphere, torus, oblate ellipsoid, conoid, serpentine, paraboloid, hyperboloid.

Basic Descriptive Geometry

Introduction: Application of descriptive geometry principles to the solution of problems involving positioning of objects in three-dimensional space; The projection of points, and planes in space; Parallel lines; True length of lines: horizontal, inclined and oblique lines; Perpendicular lines; Bearing of a line; Point view of end view of a line; Shortest distance from a point to a line; Principal lines of a plane; Edge view of a plane; True shape of an oblique plane;

Intersection of a line and plane; Angle between a line and a plane; Angle between two non-intersecting (skew) lines; Dihedral angle between two planes; Shortest distance between two skew lines.

3. Theory of Projection Drawing (25 hrs)

Perspective projection drawing; Orthographic projection; Axonometric projection; Oblique projection; First and third angle projection; Oblique projection; First and third angle projection; Oblique projection' First and third angle projection; Systems and projection.

Multi-view Drawings

Principal views: Methods for obtaining orthographic views: Projection of lines, angles and plane surfaces, analysis in three views; Projection of curved lines and surfaces; Object orientation and selection of views for best representation; Full and hidden lines. Orthographic drawings: Making an orthographic drawing, Visualizing objects from the given views; Interpolation of adjacent areas; True-length lines; Representation of holes; conventional practices.

Sectional views

Full section view; Half section; Broken section; Revolved section; Removed (detail) sections; Phantom of hidden section; Auxiliary sectional views; Specifying cutting planes for sections; conventions for hidden lines, holes, ribs, spokes.

Auxiliary Views

Basic concept and use of auxiliary views; Drawing methods and types of auxiliary views; Symmetrical and unilateral auxiliary views; Projection of curved lines and boundaries; Line of intersection between two planes; True size of dihedral angles; True size and shape of plane surfaces.

4. Development and Intersections (10 hrs)

Development: General concepts and practical considerations, Development of a right or oblique prism, cylinder, pyramid and cone; Development of truncated pyramid and cone; Triangulation method for approximately developed surfaces; Transition pieces for connecting different shapes; Development of a sphere; Intersections: Lines of intersection of geometric surfaces; Piercing point of a line and a geometric solid; intersection lines of two planes; Intersection of prisms and pyramids; Intersection of a cylinder and an oblique plane; Intersection of a sphere and an oblique plane; Constructing a development using auxiliary views; Intersection of two cylinders; Intersection of a cylinder and cone.

5. Machine Drawing (10 hrs)

Introduction: production of complete design and assembly drawings; Fundamental techniques: size and location dimensioning; placement of dimension lines and general procedures; standard dimensioning practice (IS system); Limit dimensioning: nominal and basic size, allowance, tolerance, limits of size, clearance fit, interference fit; basic hole system and shaft systems; Thread and standard machine assembly elements: screw threads: ISO standards, representation and dimensioning; Fasteners: type and drawing

representation, keys, collars, joints, springs bearings; Assembly drawings: drawing layout, bill of materials, drawing layout, bill of materials, drawing numbers.

Laboratory Work:
Freehand technical lettering and use of drawing instruments; Dimensioning; Geometrical and Projection drawing; Descriptive geometry; Projection and multiview drawings; Sectional views; Auxiliary views, Freehand sketching and visualization; Development and intersections; machine and assembly drawings.

Reference Books:
1. Luzadder, *Fundamentals of Engineering Drawing*, Prentice Hall of India Ltd., 8th edition, 1981.
2. French, C.J. Vierck and R.J. Foster, *Engineering Drawing and Graphic Technology*, McGraw-Hill, 1981.