First Semester full syllabus.

Civil Engineering (Pokhara University)

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:

1. To analyze electric circuits (A.C. & D. C).
2. To work on electrical instrumentation projects.
3. To operate, distinguish and use electrical devices and machines.

Chapter	Content	Hrs.
1	**Introduction**	2
	Role of electricity in modern society, Energy sources and production, generation, transmission and distribution of electrical energy, consumption of electricity	
2	**DC Circuit Analysis**	15
	Circuits concepts (lumped and distributed parameters), linear and nonlinear parameter, passive and active circuits, Circuit elements (Resistance, capacitance and inductance), their properties and characteriscts in a geometrical and hardware aspects, color coding, Series of parallel compilation of resistances, Equivalent resistance and its calculation, star-delta transformation, concept of power, energy and its calculations, short and open circuit, ideal and non-ideal sources, source conversion, voltage divider and current divider formula, Kirchhoff's current and voltage laws, nodal method and mesh method of network analysis (without dependent source), network theorem (i.e Superposition, Thevonin's, Norton's), maximum power transfer.	
3	**Single Phase AC Circuits Analysis**	10
	Generation of EMF by electromagnetic induction, Generation of alternating voltage, sinusoidal functions-terminology (phase, phase angle, amplitude, frequency, peak to peak value), average values and RMS or effective value of any types of alternating voltage or current waveform, phase algebra, power triangle, impedance triangle, steady state response of circuits (RL, RC,RLC series and parallel) and concept about admittance, impedance reactance and its triangle), instantaneous power, average real power, reactive power, power factor and significance of power factor, resonance in series and parallel RLC circuit, bandwidth, effect of Q factor in resource.	
4	**Poly-phase AC Circuit Analysis**	6
	Concept of a balanced three phase supply, generation and differences between single phase over three phase system, star and delta connected supply and load circuits. Line and phase voltage\current relations, power measurement, concept of three phase power and its measurement by single and two wattmeter method	

5 Electric Machines **12**

Review of magnetic circuits

Transformers: Principle of operations, features, equivalent circuits, efficiency & regulation, open circuit & short circuit tests

DC motors: Performance & operation, basic characteristics of motors & generators, speed control & selection of motors

AC machines: Induction motors (working principles, construction features and uses), Synchronous motors (working principles, construction and uses)

Textbook

1. Boylested, Albert , "Introduction of Electric circuit" Prentice Hall of India Private Limited, New Delhi
2. Tiwari, S.N, "A first course of electrical engineering" att. Wheeler & Co.Ltd Allabhad.

References:

1) Thereja B. L & Thereja A. K " A text book of Electrical Technology, S Chand Publication.
2) Jain& Jain" ABC of Electrical Engineering""

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

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 students will be able to apply the concept of calculus (Differential and integral), analytical geometry and vector in their professional courses.

Chapter **Content** **Hrs.**

1 Limit, Continuity and Derivative: 15

i. Limit, continuity and Derivative of a function with their properties
ii. Mean values Theorem with their application
iii. Higher order derivative
iv. Indeterminate forms
v. Asymptote
vi. Curvature
vii. Ideas of curve tracing
viii. Extreme values of functions of single variables

2 Integration with its Application: 17

i.Basic integration, standard integral, definite integral with their properties
ii.Fundamental theorem of integral calculus (without proof)
iii.Improper integral
iv.Reduction formulae and use of beta Gamma functions
v.Area bounded by curves
vi.Approximate area by Simpsons and Trapezoidal rule,
vii.Volume of solid revolution

3 Two dimensional geometry: 7

i. Review (circle, Translation and rotation of axes)
ii. Conic section(parabola, ellipse, hyperbola),
iii. Central conics (Introduction only).

4. Vector Algebra: 6

i. Review of vector and scalar quantity
ii. Space coordinates
iii. Product of two or more vectors
iv. Reciprocal system of vectors and their properties
v. Equations of lines and planes by vector methods

Text Books:

1. Engineering Mathematics I: Prof. D.D Sharma (Regmi), Toya Narayan Paudel, Hari Prasad Adhikari, Sukunda Publication Bhotahity , Kathmandu
2. Calculus and analytical geometry: George B Thomas, Ross L. Finney

Reference Books:

1. Calculus with analytical geometry: E.W. Swokoswski.
2. Coordinate Geometry: Lalji Prasad.
3. Vector Analysis: M. B. Singh
4. Integral Calculus: G.D. Panta.

MEC 109.2 Engineering Drawing (0-0-6)

Evaluation:

	Theory	Practical	Total
Sessional	-	50	50
Final	-	50	50
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 (12 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 (24 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 (24hrs)

Perspective projection drawing; Orthographic projection; Axonometric projection; Oblique projection; First and third angle 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 (15hrs)

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 (15hrs)

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.
3. Machine drawing P.S. Gill, S.K. Kataria and Sons, India, 7th Edition, 2008.

PHY 102.4 Physics (4-2-2)

Evaluation:

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

Course Objectives:

The main objectives of this course are:

1. To apply the theory of simple Harmonic motion in different elastic systems.
2. To apply theory of wave propagation and knowledge of resonance.
3. To apply and analyze the Optical properties in different optical systems.
4. To make use of fundamentals of electromagnetic equipment.
5. To use the knowledge of basic physics in different engineering fields.

Chapter **Content** **Hrs**

1 Mechanical Oscillation **4**

Introduction and equation of Simple Harmonic Motion, energy in Simple Harmonic Motion, oscillation of mass –spring system, compound pendulum

2 Wave motion **4**

Introduction of wave, wave velocity and particle velocity, types of waves, equation, energy, power and intensity of plane progressive wave, standing wave and resonance.

3 Acoustics **4**

Reverberation of sound, absorption coefficient, Sabines formula, introduction, production and applications of ultrasonic wave

4 Physical Optics **8**

Interference: introduction, coherent sources, interference in thin films due to reflected and transmitted light, Newton's Ring (3)
Diffraction: introduction, fraunhoffer diffraction at single silt and double silt diffraction grating (2)
Polarization: introduction, double refraction, Nicol prism, optical activity, specific rotation, wave plates (3)

5 Laser and Fiber Optics **4**

Introduction of laser, spontaneous and stimulated emission, optical pumping, He-Ne laser, Ruby Laser, use of laser, Propagation of light waves, types of optical fiber, applications of optical fiber

6 Electrostatics **8**

Electric charge, electric force, electric flux, electric potential, Gauss law and its applications, electric field intensity and electric potential due to dipole, electric potential due to quadrupole, capacitors, electrostatic potential energy, dielectrics and gauss law charging and discharging of capacitor

7 Electricity and magnetism **10**

Electric current, resistance, resistivity and conductivity, atomic view of resistivity, magnetic field, magnetic force, Lorentz force, Hall effect, Biot-Savart's law and its applications, force between two parallel conductors, Ampere's circuital law and its applications, Faraday's law of electromagnetic induction, self-induction R-L circuit, energy stored in magnetic field and magnetic energy density

8 Electromagnetism **9**

LC oscillation, Damped oscillation, forced oscillation and resonance, Maxwell's equations displacement current, wave equations in free space, continuity equation, E and B fields, poynting vector, radiation pressure

9 Photon and matter waves **4**

Photon, group velocity and phase velocity, De brogile wavelength, Schrodinger wave equation, one dimensional potential well, tunneling effect

10 Semiconductors and super conductivity **5**

Introduction, types of semiconductors Dopping, P-N Junction, Metal- semiconductor junction, junction breakdown, junction capacitance, electrical conduction in metals, insulators and semiconductors according to band theory of solids, introduction to superconductor

Textbooks:

1. Fundamental of Physic by Robert Rescnick and David Hallday
2. A Text Book of Engineering Physics, T. R. Lamichane
3. A text book of optics by Subramanyam and Brijlal
4. Modern physics by R. Murugason

Reference Books:

1. Concept of physic by H.C Verma
2. Modern Engineeering Physic by A.S Basudeva
3. Electronics by B.L Thereja
4. Principles of Electronics, V. K. Meheta

Laboratories:

1. To determine the acceleration due to gravity & radius of gyration by single bar pendulum.
2. To determine the frequency AC mains by using son mater apparatus
3. To determine the wave length by using diameter of Newton's ring
4. To determine the wave length of laser light by using diffraction grating
5. To determine the value of Modulus of Elasticity of the material given and Moment of Inertia of Circular disc using torsional pendulum
6. To determine the capacitance of given capacitor by charging and discharging through resistor
7. To determine the low resistance of a given wire and resistance per unit length of the wire by using Carey-foster bridge
8. To plot a graph current and frequency in an LRC series circuit and to find: i) the resonance frequency ii) the quality factor

Lab textbook: B. Sc Practical Physics by C. L. Arora

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:

Chapter	Content	Hrs.
1	**Introduction** History of computing and computers, programming, block diagram of computer, generation of computer, types of computer, software, Programming Languages, Traditional and structured programming concept	3
2	**Programming logic** Problems solving(understanding of problems, feasibility and requirement analysis) Design (flow Chart & Algorithm), program coding (execution, translator), testing and debugging, Implementation, evaluation and Maintenance of programs, documentation	5
3	**Variables and data types** Constants and variables, Variable declaration, Variable Types, Simple input/output function, Operators	3
4	**Control Structures** Introduction, types of control statements- sequential, branching- if, else, else-if and switch statements, case, break and continue statements; looping- for loop, while loop, do—while loop, nested loop, goto statement	6
5	**Arrays and Strings** Introduction to arrays, initialization of arrays, multidimensional arrays, String, function related to the strings	6
6	**Functions** Introduction, returning a value from a function, sending a value to a function, Arguments, parsing arrays and structure, External variables, storage classes, pre-processor directives, C libraries, macros, header files and prototyping	6

7	**Pointers**	**7**
	Definition pointers for arrays, returning multiple values form functions using pointers. Pointer arithmetic, pointer for strings, double indirection, pointer to arrays, Memory allocation-malloc and calloc	
8	**Structure and Unions**	**5**
	Definition of Structure, Nested type Structure, Arrays of Structure, Structure and Pointers, Unions, self-referential structure	
9	**Files and File Handling**	**4**
	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 hours will be assigned to the students which will help students to put together most of the programming concepts developed in earlier exercises.

Textbooks:

1. Programming with C, Byran Gottfried
2. C Programming, Balagurusami

References

1. A book on C by A L Kely and Ira Pohl
2. The C Programming Language by Kerighan, Brain and Dennis Ritchie
3. Depth in C, Shreevastav

MEC 189.2 Thermal Science (2-1-2)

Evaluation:

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

Course Objectives:

The broad objective of this course is to provide working knowledge of theories and applications of thermal science. The specific objectives of the course are:

1. To make able to apply laws of thermodynamics in various systems.
2. To make able to distinguish the cycles in various engines, and pumps.
3. To make able to calculate energy/quantity of heat transfer by conduction and radiation.

Chapter Topic Course Details **Hrs.**

1 Concept and definitions **2**

Thermodynamics, Applications of thermodynamics, Thermodynamic system, Macroscopic and microscopic and microscopic Approaches,

Properties and state of a substance: Thermodynamic properties and types, State, path, process, cycle.

- Processes (definition, characteristics, features, Examples): Quasi-equilibrium(states) process, Reversible process, Irreversible process,
- Specific volume, Pressure, Atmospheric pressure, Gauge pressure, Absolute pressure
- Equality of temperature: Zeroth law of thermodynamics

2 Properties of pure substances **3**

- Pure substance: Homogenous in composition, Homogenous in chemical aggregation, Invariable in chemical aggregation
- Vapour-liquid solid phase equilibrium in pure substance: Steam generation(formation) process from ice to steam, Wet steam and quality, T-v diagram of water, P-v Diagram of water, P-t diagram of water
- Equations of state for a simple compressible substance:
- Tables and diagrams of thermodynamic properties
- Determination of Specific volume, Specific enthalpy and Specific entropy of wet and superheated steam

3 Work and heat **2**

Definition of work: in mechanics and in thermodynamics,

Work done in quasi-equilibrium process

Displacement work, Work done in different reversible processes:

- Isochoric process
- Isobaric process
- Isothermal process
- Polytrophic process

Definition of heat: comparison between heat and work,

4 First law of thermodynamics **4**

- First law for cycle: First law for closed system undergoing a cycle, Verification of this low by wheel paddle experiment
- First law for process: Difference between stored and internal energy, Stored energy
- Internal energy: Joule's law and its verification
- Enthalpy
- Specific heats: Specific heat capacity of gas at constant volume, Specific heat capacity of gas constant pressure
- First law as a rate equation:
- Conversation of mass and the control volume
- First law for control volume
- **Steady state steady flow process:** Assumption, Steady state steady flow energy equation(SFEE), Application of SFEE: Heat exchanger, nozzle, diffuser, turbine, Rotary compressor, Throttling device, Boiler
- Uniform state uniform flow process: Assumptions, 1st law for uniform state uniform flow process

5 Second law of thermodynamics **3**

- Heat engines: 4 components diagram and the schematic diagram, efficiency

Refrigerator and heat pump: 4 components diagram and schematic diagram, COP of refrigerator and heat pump

- **Second law:** Limitation of first law of thermodynamics, Kelivn-Plank statement, Clausius statement
    - Equivalence of Kelvin-Plank and Clausius statements:
    - Factors causing irreversibility
    - Carnot theorem
    - Thermodynamic temperature scale

6 Entropy **4**

Inequality of Clausius, Entropy as a property of a system, Entropy of pure substance, Entropy change in reversible process, lost work, principle of increase of entropy, Entropy change of an ideal gas, the poly-topic process for an ideal gas, concepts of reversibility, irreversibility and availability

7 Some Power Cycles **4**

- Vapor Power Cycles: Rankine cycle (working process, efficiency, Effect of pressure and temperature on Rankine cycle)
- Air Standard Cycles: Air standard cycles: Carnot cycle (Working processes & Efficiency), Brayton cycle (Working processes & Efficiency)
- Internal combustion engines: Otto cycle (Workings processes & Efficiency), Diesel cycle (Working processes & Efficiency), Comparison between Otto an diesel cycle

8 Heat transfer **7**

- Modes of heat transfer: Conduction, Convection, radiation
- Conduction : Fourier's law (Statement, Mathematical modeling, Assumption for this laws, Thermal conductivity
- One dimensional steady state heat conduction: Through a plane, Through a hollow cylinder, Through a hollow sphere
- Composite wail: Heat flow through multilayer plane slabs, Numerical on wall of planes, cylinders and spheres in series.
- Thermal resistance and conductance: Electrical analogy of the conduction heat flow
- Overall heat transfer co-efficient: Heat transfer through a plane slab separating two fluid media
- Basic laws of radiation: Emissive power and emissivity, Stefan-Boltzmann;s law, Kirchoff;s law, Wei's displacement law
- Black and gray bodies: Reflectivity, absorptive and transmissibility, Black and grey bodies
- Radiant exchange between infinity parallel planes
- Newton's law
- Mechanism of forced and free convection
- Dimensionless parameters: Reynold's number, Nusselt's number, Pradndtl's number

9 Introduction to Refrigeration System **1**

Introduction, Refrigeration cycle

Laboratory Work:

1. To measure the pressure, specific volume and temperature
2. To find out the efficiency of a compressor.
3. To measure the rate of heat transfer by conduction.
4. To measure performance of a small internal combustion engine
5. To measure the heat transfer by thermal radiation.
6. To measure the performance of a Refrigeration/Heat pump

Textbooks:

1. Howell J.R. and R.O. Buckius, *Fundamentals of Engineering Thermodynamics*, McGrow-Hill Publishers, 1994.

Reference Books:

1. Van Wylen, G.J. and Richard E. Sonntag, *Fundamentals of Classical Thermodynamics*, Wiley Eastern Limited, New Delhi, 1989.
2. Bayazitoglu, Y. and M. Necati Ozisik, *Elements of Heat Transfer*, McGraw-Hill Book Company, 1998.
3. Kreith, F., *Principles of Heat Transfer*, International Text book Company, Scranton Pennsylvania, 2nd Edition, I965.