Pokhara University

Bachelor of Engineering in Information Technology

Year I **Semester I**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	MTH 112	Engineering Mathematics I			3	3	2	0
2	PHY 111	Physics			4	4	2	2
3	ENG 111	Communication Techniques			2	2	2	0
4	CMP 114	Problem Solving Techniques			3	3	1	0
5	ELE 110	Basic Electrical Engineering			3	3	1	2
6	CMP 113	Programming in C			3	3	0	3
					18			

Year I **Semester II**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	MTH 114	Engineering Mathematics II	MTH 112		3	3	2	0
2	ELE 211	Network Theory	ELE 110		3	3	1	2
3	MTH 130	Mathematical Foundation of Computer Science			3	3	1	0
4	ELX 210	Electronic Devices			3	3	1	2
5	MEC 120	Engineering Drawing			2	0	0	6
6	CMP 115	Object Oriented Programming in C++			3	3	1	3
					17			

Year II **Semester III**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	MTH 212	Engineering Mathematics III	MTH 114	MTH 112	3	3	2	0
2	ELX 212	Logic Circuits			3	3	1	3
3	CMP 225	Data Structure and Algorithms	CMP 113		3	3	1	3
4	MTH 221	Probability and Queuing Theory			2	2	2	0
5	CMP 213	Web Technology			3	3	0	3
6	ELX 213	Electronic Circuit and Instrumentation	ELX 210		3	3	1	2
					17			

Year II **Semester IV**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	MTH 214	Engineering Mathematics IV	MTH 212	MTH 114	3	3	2	0
2	CMP 214	Microprocessor and Assembly Language Programming	ELX 212		3	3	1	3
3	CMP 212	Programming in JAVA			3	3	0	3
4	CMP 226	Database Management Systems			3	3	1	3
5	CMP 220	Software Engineering Fundamentals			3	3	0	3
6	CMP 290	Project I			1	0	0	3
					16			

Year III **Semester V**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	CMP 331	Applied Operating Systems			3	3	0	3
2	MTH 230	Numerical Methods			3	3	1	3
3	CMP 334	Computer Organization and Architecture		ELX 212	3	3	1	2
4	MGT 321	Organization and Management			2	2	0	0
5	CMM 311	Signals, Systems & Processing			3	3	0	2
6	CMM 313	Principles of Communication	ELE 211		3	3	0	2
					17			

Year III **Semester VI**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	CMP 241	Computer Graphics			3	3	1	2
2	CMP 335	Computer Networks			3	3	0	2
3	CMP 456	Intelligent Systems			3	3	0	2
4	CMP 481	Information Systems			3	3	0	2
5	CMP 321	Object Oriented Design and Modeling through UML			3	3	1	3
6	CMP 390	Project II			2	0	0	4
					17			

Year IV **Semester VII**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	CMP 341	Multimedia Systems			3	3	0	3
2	CMP 483	ICT Project Management			3	3	1	0
3	CMP 482	Business process and IT Strategy			2	2	0	0
4	CMP 436	Network Programming	CMP 335		3	3	0	2
5	CMM 411	Telecommunications		CMM 313	3	3	1	0
6	___ ---	Elective I			3			
					17			

Year IV **Semester VIII**

S. N.	Course Code	Subject	Concurrent Registration Course	Prerequisite Course	Credit	Lecture	Tutorial	Practical
1	CMM 420	Mobile and Wireless Communication			3	3	1	0
2	ECO 411	Engineering Economics			3	3	2	0
3	CMP 484	Social and professional Issues in IT			2	2	1	0
4	___ ---	Elective II			3			
5	CMP 490	Project III			5	0	0	5

Elective Courses (BE Electronics & Communication, Electrical & Electronics, Computer, Software, and IT)

S. N.	Course Code	Subject
1	CMM 421	Wireless Communication Technology
2	CMM 443	Digital Communication Techniques
3	CMM 471	GSM Cellular Mobile Communication System
4	CMM 472	CDMA Technology
5	CMM 473	Cellular Mobile Communication
6	CMM 474	Aeronautical Communication
7	CMM 475	Optical Fiber Communication
8	CMM 476	Satellite Communication
9	CMM 477	Spread Spectrum and CDMA
10	CMM 478	Next Generation Wireless Communication
11	CMP 416	. NET Technologies
12	CMP 417	Advance Java
13	CMP 418	Advanced Web Technology
14	CMP 419	Parallel Computing
15	CMP 422	Formal Methods in Software Engineering
16	CMP 423	ERP
17	CMP 424	Geographic Information System
18	CMP 425	Data Mining
19	CMP 426	Distributed Database Management System
20	CMP 427	Cloud Computing
21	CMP 428	Big Data Technologies
22	CMP 429	Compiler Design
23	CMP 431	Distributed Operating System
24	CMP 432	Real Time Operating System
25	CMP 437	IP Switching and Routing
26	CMP 438	Network Security
27	CMP 439	Internet, Intranet and Applications
28	CMP 442	Human Computer Interaction
29	CMP 458	Artificial Neural Network
30	CMP 459	Natural Language Processing
31	CMP 485	Web Services and Applications
32	CMP 486	Mobile Computing
33	CMP 487	Internet Technology
34	CMP 488	Fuzzy Logic with Engineering Application
35	CMP 489	Bioinformatics
36	CMP 491	Oracle
37	ELE 450	Electric Energy System Management
38	ELE 451	Micro Hydro Power
39	ELE 452	Rural Electrification
40	ELE 453	SCADA
41	ELE 454	Solar Photovoltaic Technology
42	ELE 455	Electrical Drives
43	ELE 456	Power System Reliability
44	ELX 471	Microwaves Devices
45	ELX 472	Principles of Robotics and Modeling
46	ELX 473	VLSI Design
47	ELX 474	Biomedical Instrumentation
48	ELX 475	Technology System Design
49	ELX 476	Mechatronics
50	ENV 487	Environmental Impact Assessment
51	MGT 421	Engineering Entrepreneurship
52	MTH 481	Statistical Quality Control

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

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:

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

Chapters Content **Hrs.**

1 Review of Written English **2**

- Identification of Sentence and clause
- Classification of sentence (simple, compound, complex)
- transformation of sentences

2 Oral Communication and Note Taking **9**

- Variety of English (BrE, AmE, formal, informal, polite, familiar, tentative)
- General rules of pronunciation (English Vowels and Consonants)
- General rules of stress and intonations
- Oral presentation/technical talk: Environmental pollution, construction, water resources, impact of satellite communication, urban development, impact of computer in modern society

3 Technical Writing Skills **10**

- Preparation of short memoranda (Importance, formats)
- Business letters (Importance-purposes)
- Preparation of job application and CV
- Description writing (Process, Mechanism, Place etc.)
- Calling meeting and writing minutes, notification, preparation of agenda

4 Reading Skills **9**

- Comprehension questions and exercises from:
- The use and the misuse of science, Road foundation, Beauty, Custom, The story of an

hour (Kate Chopin), Knowledge and wisdom, Freedom, Letter from foreign grave (D. B Gurung), Natural Resources of Nepal: Forests & Water (Mani Bhadra Gautam)

- Note making and precise writing from any passage

Tutorial Works:

1. Some general rules of pronunciation..
2. To present a seminar paper/report/proposal.
3. To participate in a group discussion.
4. To conduct a meeting.
5. To prepare and practice to face an interview.

Textbook:

1. Andrea J. Rutherford. *Basic Communication Skills for Technology*. 2nd Edition. Addision Wesley. Pearson Education Asia (LPE) ISBN: 8178082810
2. Khanal Arjun, Communication Skills in English, Sukunda Pustak Bhawan, 2010

Reference Books:

1. Anne Eisenberg, *Effective Technical Communication*, Mc-Graw Hill 1982.
2. V.R. Narayanaswami, *Strengthen your writing*, Orient Longman, Madras.
3. Champa Tickoo & Jaya Sasikumar, *Writing with a Purpose*, Oxford University Press, Bombay.
4. A handbook of pronunciation of English words (with 90-minute audio cassettes) Communication Skills in English.
5. Chopin, Kate. "The Story of an Hour", *Creative Delights*
6. *Gautam Shreedhar, Creation & Criticism: A Miscellaneous Thought*
7. *Gautam Mani Bhadra, Essays, Stories, Passages, Paragraphs and Letter writing for the Young Learners, Nirantar Prakashan, Kathmandu, 2008*

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.

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

Problem Solving Techniques (3-2-0)

Evaluation:

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

Course Objectives:

A large part of everyday activity involves problem solving in some form. On order to solve problem one must think analytically to find a solution to a problem. The main aim of this course is:

1. To improve and impart conceptual clarity in thinking analytically and logically.
2. To provide fundamental means of approach how to translate verbal discussion onto analytical data and then how to solve it by computer.

Course Contents:

1. Basic Concepts of Problem Solving **10 hrs**

Introduction to Problem Solving Approach. How to count. Use of induction principle. Problems of Logic and Issues of Parity.

2. Application of Geometry **10 hrs**

Classical Planar Geometry. Analytic Geometry. Solid Geometry and miscellaneous problems.

3. Miscellaneous Problem Solving Techniques **15 hrs**

Probabilistic approach to solving Counting Problems. Logic Problems (Simple logic, theory of games. Tracing routes. Learning from Parity. Mysterious arithmetic problems and surprise). Problems from Recreational math. (Magic square and Weighing problems). Problems of Algebra and Analysis (Inequality, Trignometry and related ideas).

4. Solving Miscellaneous Real Life Problems **10 hrs**

Miscellaneous problems, impossible problems, Problems from everyday life and Statistics.

Laboratory Work:

Realization and Implementation of the numerous problems and various problem-solving techniques learned is to be implemented in C Programming Language. However, the practical implementation is also considered as an assignment for the "Programming in C" course module.

Textbooks:

1. Krantz, Steven G., *Techniques of Problem Solving*, University Press, 1998, ISBN:81-737-116-X

Reference Books:

1. Etter, D. M., *Engineering Problem Solving with ANSI C*, Prentice Hall, NJ, 1995,
2. Lakatos, *Proofs and Refutation*, Cambridge University Press, 1976.
3. Polya, G., *How to Solve It*, Princeton University Press, Princeton, 1998.

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

MTH 114 Engineering Mathematics II (3 – 2 – 0)

Evaluation:

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

Course Objectives:

The main objective of this course is to provide the basic knowledge of three-dimensional geometry, calculus of several variables, differential equation and Laplace transform. After the completion of this course, students can use their knowledge in their professional course.

Course Contents:

1 Three Dimensional geometry **12 hrs**

i) Review of direction cosines, direction ratios, Planes
ii) Straight lines
iii) Sphere and its tangent plane
iv) Cone and cylinder(definitions, standard equation only)

2 Partial derivatives and Extreme values for function of two or more variables **6 hrs**

i) Definitions, total derivatives, Chain rule, Eulers theorem for function of two or three variables, its application
ii) Extreme values for two or more variables

3 Laplace transformation **8 hrs**

i) Definition
ii) Derivation of formulae
iii) Application of Laplace transform,
iv) Inverse Laplace transform
v) Convolution theorem on Laplace transform and application

4 Differential equation **13 hrs**

i) Order and degree of differential equation
ii) First order differential equation with their solutions (separable, reducible to separable form exact ness condition), linear and Bernoulli's equation)
iii) Second order differential equation (Homogeneous and non homogeneous) with constant coefficient as well as variable coefficients.
iv) Initial value problem.
v) Power Series solution
vi) Legendres and Bessel equation with their solution, properties and application

5. Double Integral **6 hrs**

i) Definitions, Fubinis theorems (statement only)
ii) Change of order,
iii) Change Cartesian integral to equivalent polar integral
iv) Area and volume by double integral

Text Books:

1. Engineering Mathematics II: Prof. D.D Sharma (Regmi), Toya Narayan Paudel, Hari Prasad Adhikari, Sukunda publication, Bhotahity, Kathmandu.
2. Advance Engineering Mathematics : Erwin Kreyszig.

Reference Books:

1. Calculus with analytical geometry: E.W. Swokoswski.
2. Algebra: G.D Pant
3. Three Dimensional Geometry: Y.R Sthapit, B.C Bajracharya
4. Calculus and analytical geometry: George B Thomas, Ross L. Finney

MEC 20 Engineering Drawing (0-0-6)

Evaluation:

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

Course Objectives:

The objective of this course is to develop the basic concepts on the projection of points, lines, planes and geometric solids. This course will impart the skills of drafting and sketching to facilitate communication. After the completion of this course students will be able to draw assembly of machine drawing.

Course Contents:

1. Instrumental Drawing, Practices and Techniques (12 hrs)

Equipment and meterials, 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 (24 hrs)

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 (15 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 (15 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.
3. Machine drawing P.S. Gill, S.K. Kataria and Sons, India, 7th Edition, 2008.

ELX 212 Logic Circuits (3-1-3)

Evaluation:

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

Course Objectives:
The purpose of the course is to provide basic knowledge of logic systems. Moreover, it enables to design a basic digital computer.

Course Contents:

1. **Introduction** **(3 hrs)**
   - 1.1 Numerical representation
   - 1.2 Digital number system
   - 1.3 Digital and analog system

2. **Number System and Codes** **(6 hrs)**
   - 2.1 Binary to decimal and decimal to binary conversions
   - 2.2 Octal, hexadecimal number system and conversions
   - 2.3 Binary Arithmetic 1's complement and 9's complements
   - 2.4 Gray code
   - 2.5 Instruction codes
   - 2.6 Alphanumeric characters
   - 2.7 Modulo2 system and 2's complement
   - 2.8 Binary Coded Decimal (BCD) and hexadecimal codes
   - 2.9 Parity method for error detection

3. **Boolean Algebra and Logic Gates**
   (4 hrs)
   - 3.1 Basic definition
   - 3.2 Basic properties and theorem of Boolean algebra
   - 3.3 DeMorgan's Theorem
   - 3.4 Logic gates and truth tables
   - 3.5 Universality of NAND and NOR gates
   - 3.6 Tristate logic

4. **Simplification of Boolean Function** **(5 hrs)**
   - 4.1 Venn diagram and test vectors
   - 4.2 Karnaugh maps up to five variables
   - 4.3 Minimum realization
   - 4.4 Don't care conditions
   - 4.5 Logic gates implementation
   - 4.6 Practical design steps

5. **Combination Logic** **(4 hrs)**
   - 5.1 Design procedure
   - 5.2 Adders and subtractors
   - 5.3 Code conversion
   - 5.4 Analysis procedure
   - 5.5 Multilevel NAND and NOR circuits,
   - 5.6 Parity generation and checking

6. **MSI and LSI Components in Combinational Logic Design** **(6 hrs)**
   - 6.1 Binary adder and subtractor,
   - 6.2 Decimal adder
   - 6.3 Magnitude comparator
   - 6.4 Decoder and encoder
   - 6.5 Multiplexer and demultiplexer
   - 6.6 Read-only memory (ROM)
   - 6.7 Programmable Logic Array (PLA)

7. **Sequential Logic** **(6 hrs)**
   - 7.1 Event driven model and state diagram
   - 7.2 Flip-flops and their types
   - 7.3 Analysis of clocked sequential circuits
   - 7.4 Decoder as memory devices
   - 7.5 State reduction and assignment
   - 7.6 Synchronous and asynchronous logic
   - 7.7 Edge triggered device
   - 7.8 Master slave flip-flops
   - 7.9 JK and T flip-flops

8. **Registers, Counters and Memory Unit** **(6 hrs)**
   - 8.1 Registers
   - 8.2 Shift registers
   - 8.3 Superposition of registers
   - 8.4 Generation of codes using registers
   - 8.5 Ripple
   - 8.6 Synchronous and Johnson Counters
   - 8.7 Design of multiple input circuits
   - 8.8 Random Access Memory (RAM)
   - 8.9 Memory decoding
   - 8.10 Error-correction code
   - 8.11 Output hazards races

9. **Arithmetic Logic Units** **(5 hrs)**
   - 9.1 Nibble adder
   - 9.2 Adder/ subtractor unit
   - 9.3 Design of arithmetic logic unit

9.4 Status register
9.5 Design of shifter
9.6 Processor unit
9.7 Design of accumulator

Laboratory Work:

1. Familiarization with logic gates.
2. Encodes and decodes
3. Multiplexer and demultiplexer
4. Design of simple combination circuits.
5. Design of adder/subtractor
6. Design of flip-flop
7. Design of counter
8. Clock driven sequential circuits
9. Conversion of parallel data into serial format.
10. Generation of timing signal for sequential system.

Text Books:

1. M. Mano, Digital Logic and Computer Design, Prentice Hall of India 1998.
2. M. Mano, Computer System Architecture, Prentice Hall of India, 1998.

Reference:

1. M. Mano, Digital Design, Prentice Hall of India, 1998.

CMP 213 Web Technology (3-0-3)

Evaluation

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

Course Objectives:
The purpose of the course is to provide basic techniques of Web Technology and Web Programming. After completing the course, students will be familiar with the recent technologies such as web technology, client site programming, server side programming, and will be able to develop web based applications using most recent technologies.

Course Contents:

1. **Fundamentals** **(6 hrs)**
   - 1.1 Introduction to Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions
   - 1.2 Overview of different protocols: HTTP, POP, SMTP, FTP, WAP, Web Architecture, Web Standards
   - 1.3 Domain name and hierarchy, domain name registration process, web hosting

2. **Introduction to HTML and XHTML** **(6 hrs)**
   - 2.1 Origins and evaluation of HTML, Basic Syntax
   - 2.2 Standard HTML Document Structure and Basic Text Formatting
   - 2.3 Images, Hypertext Links, Lists, Tables, Frames, Forms, Multimedia in HTML

3. **Cascading Style Sheets** **(5 hrs)**
   - 3.1 Introduction and Levels of Style Sheets
   - 3.2 Style Specification Formats, Style classes, Properties and Property values, color, the and tags

4. **Introduction to Java Script** **(11 hrs)**
   - 4.1 Basics of Java script and Document Object Model
   - 4.2 Element Access in Java scripts, event and event handling
   - 4.3 DOM Event Model and Element Positioning
   - 4.4 Moving elements and Element visibility
   - 4.5 Changing colors and fonts
   - 4.6 Dynamic content and stacking elements

4.7 Locating the mouse cursor and reacting to a mouse click
4.8 Dragging and dropping elements

5. Programming in PHP and MYSQL (17 hrs)

5.1 Origins and Uses of PHP
5.2 Overview of PHP and General Syntactic Characteristics
5.3 Primitives, Operations, and Expressions
5.4 Output and Control Statements
5.5 Arrays, Functions, Basic Pattern Matching, Form Handling, Files Handling
5.6 Cookies, Session Tracking, Database Access with PHP and MySQL

Laboratory:

1. Every topic of the course content should be included for the lab.
2. Individual or group project work to develop a web application could be assigned. This should cover most of the technologies included in the course content

Text Book:

Robert W. Sebesta, Programming the World Wide Web, Addison-Wesley, ISBN-10: 0321489691

References:

1. W3Schools Online Web Tutorials, www.w3school.com
2. Ipfaffenberger, World Wide Web Bible, BPB, ISBN: 81-7029-781-8
3. Powell, The Complete reference to HTML and XHTML, TATA McGRAW HILL, Fourth Edition

CMP 115 Object Oriented Programming in C++ (3-1-3)

Evaluation:

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

Course Objectives:

The objective this course is to familiarize with Object Oriented Concept, to introduce the fundamentals of C++, to enable the students to solve the problems in Object Oriented technique and to cope with features of Object Oriented Programming.

Course Contents:

1 **Thinking Object Oriented** **4 hrs**

Object oriented programming a new paradigm, a way of viewing world agent, types of classes, computation as simulation, coping with complexity, nonlinear behavior of complexity, abstraction mechanism

2 **Classes and Methods** **7 hrs**

Review of structures, classes and inheritance, state, behavior, method, responsibility, encapsulation, data hiding, Functions: friend function, inline function, static function, reference variable, default argument

3 **Message, Instance and Initialization** **6 hrs**

Message, message passing formalization, message passing syntax in C++, mechanism for creation and initialization (constructor and its types), Issues in creation and initialization: memory map, memory allocation methods and memory recovery

4 **Object Inheritance and Reusability** **9 hrs**

Introduction to inheritance, Subclass, Subtype, Principle of Substitutability; Forms of polymorphism and their implementation in C++, inheritance merits and demerits, composition and its implementation in c++, The *is-a* rule and has-*a* rule, Composition and Inheritance contrasted, Software reusability

5 **Polymorphism** **8 hrs**

Polymorphism in programming language, Varieties of polymorphism, compile time polymorphism, function overloading, operator overloading, type conversion, polymorphic variable, run time polymorphism, object pointer, this pointer, virtual function, overriding, deferred method, pure polymorphism.

6	**Template and generic programming** Generic and template functions and classes, cases study: container class and the standard template library, Exception handling	**4 hrs**
7	**Object oriented Design** Reusability implies non- interference, Programming in small and programming in large, components and behaviors, role of behaviors in OOP, CRC, sequence diagram, Software components, formalizing the interface, interface and implementation, Design and representation of components, coming up with names, implementation components, integration of components	**7 hrs**

Laboratory Work

There shall be 20 exercises in minimum, as decided by the faculty. The exercises shall encompass a broad spectrum of real-life and scientific problems, development of small program to the development of fairly complex subroutines, programs for engineering applications and problem solving situations. Laboratory assignments will be offered in groups of two to four for evaluation purpose. In general, the Laboratory Work must cover assignments and exercises from the following areas:

1. Data types – control structures, functions and scoping rules.
2. Composite data types, C++ strings, use of “Constant " keyword, pointers and references
3. Classes and data abstraction
4. Inheritance, abstract classes and multiple inheritance
5. Friend functions, friend classes and operator overloading.
6. Static class members
7. Polymorphism, early binding and late binding
8. C++ type conversion
9. Exception handling
10. Function templates, class templates and container classes.

Text Books:

1. Budd, T., *An Introduction to Object Oriented Programming*, Second Edition, Addison-Wesley, Pearson Education Asia, ISBN: 81-7808-228-4.
2. R. Lafore, *Object Oriented Programming in Turbo C++*, Galgotia Publications Ltd. India, 1999

Reference Books:

1. E Balaguruswamy, Object Oriented Programming with C++, Third Edition
2. Tata McGraw-Hill ISBN:0-07-059362-0, Parson David, Object Oriented Programming with C++, BPB Publication\ISBN817029-447-9

MTH 130 Mathematical Foundation of Computer Science (3-1-0)

Evaluation:

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

Course Objectives:

1. The main objective of this course is to build up the mathematical foundation for the study of computational science and computer technology.
2. This course introduces the student to discrete mathematics and finite state automata through an algorithmic approach and focuses on various problems solving technique.
3. It helps the target student in gaining fundamental and conceptual clarity in the area of Logic Reasoning. Algorithms, Recurrence relation. Graph Theory, and Theory of Automata.

Course Contents:

1. **Graph Theory** **(15 hrs)**
   - 1.1 Definitions
   - 1.2 Directed and Undirected Graphs
   - 1.3 Walk, Path, Circuits,
   - 1.4 Connected Components. Connected Component Algorithm
   - 1.5 Shortest –Path Algorithms
   - 1.6 Computer representation a graph (Static Representation only, like Adjacency Matrix, Incidence Matrix, Path Matrix)
   - 1.7 Bi-partite graphs
   - 1.8 Regular graphs
   - 1.9 Planar graphs
   - 1.10 Euler graph
   - 1.11 Hamilton graph and their properties and characterization.
   - 1.12 Application of graph theory in computer science (with example).

2. **Logic and Induction** **(8 hrs)**
   - 2.1 Propositions and Truth functions
   - 2.2 Predicates and Quantification
   - 2.3 Propositional and Predicate Logic
   - 2.4 Expressing statement in the language of Logic
   - 2.5 Deduction in Predicate Logic
   - 2.6 Elementary Step-wise Induction and Complete Induction.

3. **Introduction to Mathematical Reasoning** **(7 hrs)**
   - 3.1 Formal Languages and Inductive Definitions: Axioms,
   - 3.2 Rules of Inference and Proofs

3.3 Direct Proof and Indirect Proof
3.4 Formal Proof and Informal Proof.

4. Recurrence Relations (7 hrs)

4.1 Recursive Definition of Sequences
4.2 Differencing and Summation
4.3 Solution of Linear Recursive Relation
4.4 Solution of Non-linear Recurrence Relation.

5. Finite State Automata (8 hrs)

5.1 Alphabets and Language
5.2 Notion of a State
5.3 State Machine (FSM and DFA)
5.4 Regular Expression
5.5 Equivalence Relation.

References:

1. Richard Johnsonbaugh, Discrete Mathematics, Fifth Edition, Addison Wesley, Pearson Education Asia (LPE), ISBN: 81-780-82799, 2000
2. Mott, Joe L., Kandel Abraham and Baker, Theodoe P., Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice-Hall, ISBN: 81-203-1502-2
3. Liu, C.L., Elements of Discrete Mathematics, TMH, 2000, ISBN: 0-07-043476-X
4. Trus, J., Discrete Mathematics for Computer Scientists, Second Edition, Addision Wesley ISBN: 0-201-36061,1999

ELX 213.3 Electronic Devices (3-1-2)

Evaluation:

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

Course Objectives:

The purpose of the course is to provide knowledge of principles of electronic devices and circuits. Moreover, it provides a method for analysis of semiconductor devices.

Course Contents:

1. **Semiconductor diode** **(8 hrs)**
   - 1.1 Review of conduction in semiconductors
   - 1.2 Theory of p-n junction
   - 1.3 Band structure of p-n junction
   - 1.4 The p-n junction as a diode
   - 1.5 The effects of temperature in V-I characteristics
   - 1.6 Space- charge of transition region capacitance and its effects
   - 1.7 Diffusion capacitance and its effects
   - 1.8 Diode switching times
   - 1.9 Zener diode
   - 1.10 Tunnel diode
   - 1.11 Construction
   - 1.12 Characteristics and Applications of Schottky diode
   - 1.13 Varactor diode and Metal Oxide Varister

2. **Non-Linear Model** **(2 hrs)**
   - 2.1 Basic properties of non-linear elements
   - 2.2 Non-linear circuit analysis (Graphical/ Algebraic analysis methods)
   - 2.3 Piecewise linear modeling
   - 2.4 Use and application of SPICE in analysis

3. **Bi-polar Junction Transistor (BJT)** **(7 hrs)**
   - 3.1 Construction of a BJT
   - 3.2 Working principal of BJT
   - 3.3 Modes of operation Transistor Configuration
   - 3.4 Analytical expression for transistor characteristics
   - 3.5 Input-output characteristics of CB, CE and CC transistor configurations
   - 3.6 α, β, and γ and their relationship
   - 3.7 Avalanche effect
   - 3.8 Early Effect
   - 3.9 Reach – through

3.10 The EBERS-Moll equations
3.11 BJT switching time
3.12 Maximum voltage rating

4. **BJT biasing and Thermal Stabilization (6 hrs)**
   4.1 Biasing and its needs
   4.2 Types of biasing (fixed bias, collector to bias, Voltage divider or self bias)
   4.3 DC/AC load line, Quiescent or Q point
   4.4 Stability and stability factor of biasing circuit
   4.5 Design of biasing circuit
   4.6 Bias compensation (diode compensation for V_{BE} and I_{CO})
   4.7 Thermal runway and stability.

5. **The Small Signal Low Frequency Analysis Model of BJT (7 hrs)**
   5.1 Low frequency hybrid model
   5.2 Measurement of h parameter
   5.3 Transistor configurations and their hybrid model
   5.4 Expression for Current gain, Voltage gain, input impedance and output impedance of two port BJT network
   5.5 Analysis of a transistor amplifier circuit using h-parameters
   5.6 Expression for voltage gain, current gain, input impedance and output impedance of CE, CB and CC configurations using h-model
   5.7 Comparison of characteristics of CB, CE and CC, Transistor as an amplifier

6. **The Junction Field Effect Transistor (JFET) (6 hrs)**
   6.1 Comparison between BJT and JFET
   6.2 Construction and types of JFET, Working Principal of JFET
   6.3 The pinch-off voltage and its importance
   6.4 Drain and transfer characteristics
   6.5 Trans-conductance, Biasing and load line
   6.6 V-I characteristics
   6.7 Configuration of JFET (CS, CD, CG), small signal model and analysis of CS, CD, CG, generalized FET Amplifier
   6.8 Uni-Junction transistor

7. **The Metal Oxide Semiconductor (3 hrs)**
   7.1 Construction and Working Principles of DMOSFET, EMOSFET, and CMOS load line biasing
   7.2 V-I characteristics
   7.3 Small signal analysis Model of MOSFET

8. **Clippers, Clampers and Rectifiers (6 hrs)**
   8.1 Rectifier, Half Wave and Full Wave (Center tapped and Bridge) rectifier
   8.2 Average Value RMS value
   8.3 Ripple factor, Rectification efficiency, Form factor of half wave and full wave rectifier
   8.4 Diode clipper and Clamper harmonic components

8.5 Filters: inductor and capacitor filters- L section and P-I section filters

Laboratory:

1. Familiarization with equipment
2. Measurement of characteristics of PN Diode and Zener diode
3. Study of half wave and full wave rectifier circuits
4. Study of full wave rectifier (Center tap and Bridge) rectifier circuits
5. Study of Clipper Circuits
6. Measurement of input and output characteristics of CB, CE configurations
7. Measurement of input and output characteristics of JFET
8. Measurement of input and output characteristics of NMOS
9. Measurement of input and output characteristics of PMOS
10. Measurement of input and output characteristics of CMOS

Text Books:

1. S. Sedra and K. C. Smith, *"Microelectronics Circuits"* Holt Rinebart and Winston, New York.
2. J Milliman and Halkias, *"Electronics Devices and Circuits"* Mc Graw Hill
3. T. F. Bogart "*Electronic Devices and Circuits*" PHI

References:

1. V. K. Mehta, “principles *of Electronics* “S Chand & Co. Fifth edition
2. M. N. Horenstein," *Microelectronic Circuits and Devices*" second edition, Prentice Hall of india
3. Dhruba Banjade, Electronic Devices, Sukunda Prakashan, Kathmandu, Nepal

MTH 212 Engineering Mathematics III (3-2-0)

Evaluation:

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

Course Objectives:

The main objectives of this course is to provide the basic knowledge of linear algebra, vector calculus, fourier series, linear programming by graphical and simplex methods. After the completion of this course, students can use their knowledge in their professional course.

Course Contents:

1. Matrix and Determinant: (8 hrs)

1.1 Review of Matrix and determinant with their properties
1.2 System of linear equation with their solutions by Gauss elimination methods
1.3 Rank of matrix
1.4 Consistency of system of linear equation
1.5 Vector space and sub space
1.6 Linear transformation
1.7 Eigen values and vectors, Cayley Hamilton theorem (statement only) and its application.

2. Vector Calculus (16 hrs)

2.1 Differentiation and integration of vectors
2.2 Gradient, divergence and curl with their properties (without proof)
2.3 Line integral: Definition of line integral, Evaluation of line integral, properties, Greens theorem, Area by Greens theorem
2.4 Surface integral: Surface integral, tangent planes, Gauss divergence theorem, Dirichelet integral
2.5 Stokes theorem

3. Infinite series (8 hrs)

3.1 Sequence and series
3.2 Necessary condition of convergence of infinite series
3.3 P-test (hyper-harmonic test)
3.4 Ratio test
3.5 Root test
3.6 Integral test
3.7 Leibnitz test and absolute convergence
3.8 Interval of convergence of power series.
3.9 Taylor and Maclaurin expansion (statement only) and its application

4. Fourier Series (6 hrs)

4.1 Periodic function, Trigonometric series, even and odd function
4.2 Fourier series of a function with period 2π and arbitrary period 2L

4.3 Fourier sine and cosine series representation of the half range function

5. Linear Programming (7 hrs)

5.1 System of Linear Inequalities

5.2 Linear Programming

5.2.1 Model Formulation

5.2.2 GraphicalSolution

5.2.3 Simplex method

5.2.4 The Dual model

5.2.5 Dual Simplex Method

Text Books:

1. Kreyszig, Erwin.*Advance Engineering Mathematics*(8th edition). New Delhi:Wiley-Easter Publication.
2. Paudel, Toya Narayan.*Engineering Mathematics III*, Bhotahity: Sukunda publication.

References:

1. Thomas, George B.& Finney,Ross L.*Calculus and Analytical Geometry.*
2. Swokoswski, E.W.*Calculus with Analytical Geometry.*
3. Singh, M.B.*Vector Analysis.*
4. Pant, G. D.*Algebra.*

CMP 225 Data Structure and Algorithm (3-1-3)

Evaluation:

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

Course Objectives:

The purpose of the course is to provide fundamental knowledge on data structure designing and implementation for storing information. Moreover, it provides the knowledge of various algorithms used in computer science.

Course Contents:

1. **Introduction to Data Structure and algorithms** **(3hrs)**
   - 1.1. Review of Array, Structure, Union, Class, Pointer
   - 1.2. Abstract data type
   - 1.3. Data Structure Concept

2. **The Stack** **(4hrs)**
   - 2.1. Definition and Primitive Operations
   - 2.2. Stack as an ADT, Stack operations
   - 2.3. Stack application
   - 2.4. Evaluation of Infix Postfix and prefix expressions.
   - 2.5. Expression Conversion

3. **Queue** **(3hrs)**
   - 3.1. Definition, Queue as an ADT and Primitive operations in queue
   - 3.2. Linear and circular queue and their application
   - 3.3. Double Ended Queue
   - 3.4. Priority queue

4. **Static and Dynamic List** **(8hrs)**
   - 4.1. Definition and Array implementation of lists
   - 4.2. Queues as a list
   - 4.3. Link List Definition and link list as an ADT
   - 4.4. Dynamic implementation
   - 4.5. Basic operations in linked list
   - 4.6. Doubly linked lists and its advantages
   - 4.7. Implementation of Doubly Linked List
   - 4.8. Linked Implementation of stacks and Queues,

5. **Recursion** **(2hrs)**
   - 5.1. Principle of recursion and Comparison between recursion and iteration
   - 5.2. Factorial, TOH and Fibonacci sequence
   - 5.3. Applications of recursion and Validity of an Expression

6. Trees (7hrs)

6.1. Concept and definitions
6.2. Basic operation in binary tree
6.3. Binary search tree and insertion /deletions
6.4. Binary tree traversals (preorder, post order and in order) tree height level and depth
6.5. Balanced trees
6.6. AVL balanced trees
6.7. Balancing algorithm
6.8. The Huffman algorithm
6.9. Game tree
6.10. B- Tree.

7. Sorting (5hrs)

7.1. Internal and external sort
7.2. Insertion and selection sort
7.3. Exchange sort
7.4. Bubble and quick sort
7.5. Merge and Radix sort
7.6. Shell sort
7.7. Heap sort as priority queue
7.8. Efficiency of sorting.

8. Searching (3hrs)

8.1. Search technique essential of search
8.2. Sequential search
8.3. Binary search
8.4. Hashing :
8.5. Hash function and hash tables ,
8.6. Collision resolution technique ,
8.7. Efficiency comparisons of different search technique.

9. Graphs (8hrs)

9.1. Representation and applications
9.2. Graphs as an ADT
9.3. Transitive closure and Wars hall's algorithm
9.4. Graphs types
9.5. Graphs traversal and spanning forests
9.6. Kruskal 's and Round Robin algorithms
9.7. Shortest-path algorithm
9.8. Greedy algorithm
9.9. Dijkstra's Algorithm

10. Algorithms (2hrs)

10.1. Deterministic and no-deterministic algorithm
10.2. Divide and conquer algorithm
10.3. Series and Parallel algorithm

10.4. Heuristic and Approximate algorithm.
10.5. Big O Notation

Laboratory:

There shall be lab exercises based on C or C++

1. Implementations of stack
2. Implementations of linear and circular queues
3. Solutions of TOH and Fibonacci Recursion
4. Implementation of linked list: singly and double linked
5. Implementation of trees; AVL tree Balancing of ALV
6. Implementation of merge sort
7. Implementation of search: sequential tree and binary
8. Implementation of Graphs: Graph traversals
9. Implementation of hashing
10. Implementation of heap

Text Books:

1. Y Langsam, MJ, Augenstein and A.M , Tenenbaum Data Structures using C and C++ , Prentice Hall India
2. G.W Rowe, Introduction to Data Structure and Algroithms with C and C++ , prentice Hall India

Reference Books:

1. R.L Kruse, B.P. Leung, C.L. Tondo, data structure and program Design in C Prentice hall India
2. G. Brassard and P. Bratley fundamentals of Algroithms, prentice hall India

ELX 212.3 Logic Circuits (3-1-3)

Evaluation:

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

Course Objectives:
The purpose of the course is to provide basic knowledge of logic systems. Moreover, it enables to design a basic digital computer.

Course Contents:

1. **Introduction** **(3 hrs)**
   - 1.1 Numerical representation
   - 1.2 Digital number system
   - 1.3 Digital and analog system

2. **Number System and Codes** **(6 hrs)**
   - 2.1 Binary to decimal and decimal to binary conversions
   - 2.2 Octal, hexadecimal number system and conversions
   - 2.3 Binary Arithmetic 1's complement and 9's complements
   - 2.4 Gray code
   - 2.5 Instruction codes
   - 2.6 Alphanumeric characters
   - 2.7 Modulo2 system and 2's complement
   - 2.8 Binary Coded Decimal (BCD) and hexadecimal codes
   - 2.9 Parity method for error detection

3. **Boolean Algebra and Logic Gates** **(4 hrs)**
   - 3.1 Basic definition
   - 3.2 Basic properties and theorem of Boolean algebra
   - 3.3 DeMorgan's Theorem
   - 3.4 Logic gates and truth tables
   - 3.5 Universality of NAND and NOR gates
   - 3.6 Tristate logic

4. **Simplification of Boolean Function** **(5 hrs)**
   - 4.1 Venn diagram and test vectors
   - 4.2 Karnaugh maps up to five variables
   - 4.3 Minimum realization
   - 4.4 Don't care conditions
   - 4.5 Logic gates implementation
   - 4.6 Practical design steps

5. **Combination Logic** **(4 hrs)**

5.1 Design procedure
5.2 Adders and subtractors
5.3 Code conversion
5.4 Analysis procedure
5.5 Multilevel NAND and NOR circuits,
5.6 Parity generation and checking

6. **MSI and LSI Components in Combinational Logic Design** **(6 hrs)**
   6.1 Binary adder and subtractor,
   6.2 Decimal adder
   6.3 Magnitude comparator
   6.4 Decoder and encoder
   6.5 Multiplexer and demultiplexer
   6.6 Read-only memory (ROM)
   6.7 Programmable Logic Array (PLA)

7. **Sequential Logic** **(6 hrs)**
   7.1 Event driven model and state diagram
   7.2 Flip-flops and their types
   7.3 Analysis of clocked sequential circuits
   7.4 Decoder as memory devices
   7.5 State reduction and assignment
   7.6 Synchronous and asynchronous logic
   7.7 Edge triggered device
   7.8 Master slave flip-flops
   7.9 JK and T flip-flops

8. **Registers, Counters and Memory Unit** **(6 hrs)**
   8.1 Registers
   8.2 Shift registers
   8.3 Superposition of registers
   8.4 Generation of codes using registers
   8.5 Ripple
   8.6 Synchronous and Johnson Counters
   8.7 Design of multiple input circuits
   8.8 Random Access Memory (RAM)
   8.9 Memory decoding
   8.10 Error-correction code
   8.11 Output hazards races

9. **Arithmetic Logic Units** **(5 hrs)**
   9.1 Nibble adder
   9.2 Adder/ subtractor unit
   9.3 Design of arithmetic logic unit
   9.4 Status register
   9.5 Design of shifter
   9.6 Processor unit

9.7 Design of accumulator

Laboratory Work:

1. Familiarization with logic gates.
2. Encodes and decodes
3. Multiplexer and demultiplexer
4. Design of simple combination circuits.
5. Design of adder/subtractor
6. Design of flip-flop
7. Design of counter
8. Clock driven sequential circuits
9. Conversion of parallel data into serial format.
10. Generation of timing signal for sequential system.

Text Books:

1. M. Mano, Digital Logic and Computer Design, Prentice Hall of India 1998.
2. M. Mano, Computer System Architecture, Prentice Hall of India, 1998.

Reference:

1. M. Mano, Digital Design, Prentice Hall of India, 1998.

CMP 483.3 Web Technology (3-0-3)

Evaluation

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

Course Objectives:

The purpose of the course is to provide basic techniques of Web Technology and Web Programming. After completing the course, students will be familiar with the recent technologies such as web technology, client site programming, server side programming, and will be able to develop web based applications using most recent technologies.

Course Contents:

1. **Fundamentals** **(6 hrs)**
   - 1.1 Introduction to Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions
   - 1.2 Overview of different protocols: HTTP, POP, SMTP, FTP, WAP, Web Architecture, Web Standards
   - 1.3 Domain name and hierarchy, domain name registration process, web hosting

2. **Introduction to HTML and XHTML** **(6 hrs)**
   - 2.1 Origins and evaluation of HTML, Basic Syntax
   - 2.2 Standard HTML Document Structure and Basic Text Formatting
   - 2.3 Images, Hypertext Links, Lists, Tables, Frames, Forms, Multimedia in HTML

3. **Cascading Style Sheets** **(5 hrs)**
   - 3.1 Introduction and Levels of Style Sheets
   - 3.2 Style Specification Formats, Style classes, Properties and Property values, color, the and tags

4. **Introduction to Java Script** **(11 hrs)**
   - 4.1 Basics of Java script and Document Object Model
   - 4.2 Element Access in Java scripts, event and event handling
   - 4.3 DOM Event Model and Element Positioning
   - 4.4 Moving elements and Element visibility
   - 4.5 Changing colors and fonts
   - 4.6 Dynamic content and stacking elements
   - 4.7 Locating the mouse cursor and reacting to a mouse click
   - 4.8 Dragging and dropping elements

5. Programming in PHP and MYSQL (17 hrs)

5.1 Origins and Uses of PHP
5.2 Overview of PHP and General Syntactic Characteristics
5.3 Primitives, Operations, and Expressions
5.4 Output and Control Statements
5.5 Arrays, Functions, Basic Pattern Matching, Form Handling, Files Handling
5.6 Cookies, Session Tracking, Database Access with PHP and MySQL

Laboratory:

1. Every topic of the course content should be included for the lab.
2. Individual or group project work to develop a web application could be assigned. This should cover most of the technologies included in the course content

Text Book:
Robert W. Sebesta, Programming the World Wide Web, Addison-Wesley, ISBN-10: 0321489691

References:

1. W3Schools Online Web Tutorials, www.w3school.com
2. Ipfaffenberger, World Wide Web Bible, BPB, ISBN: 81-7029-781-8
3. Powell, The Complete reference to HTML and XHTML, TATA McGRAW HILL, Fourth Edition

Electronic Circuit and Instrumentation

Evaluation:

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

Course Objectives:

The purpose of the course is to provide knowledge of designing amplifiers and electronic circuits. It also provides knowledge of measurement & instrumentation and instrumentation system.

Course contents:

1. Low Frequency Transistor Amplifier Circuits (6 hrs)

1.1 Need of cascading and gain calculation of n-stage cascaded amplifiers
1.2 Choice of configuration in a cascade
1.3 Voltage gain, current gain, input and output impedances of two stage RC coupled amplifier
1.4 Amplitude, frequency and phase distortions
1.5 Lower cut off frequency, upper cut off frequency and bandwidth
1.6 Frequency response of RC-Stage amplifiers
1.7 Effects of bypass capacitor on frequency response

2. Large Signal Amplifiers (5 hrs)

2.1 Analysis of large signal model
2.2 Classification of power amplifiers
2.3 Efficiency calculation of class A and B amplifiers
2.4 Direct coupled load and transformer coupled load class A amplifiers
2.5 Push pull concept and transformer coupled load class B push pull amplifiers
2.6 Complementary symmetry class B push pull amplifiers
2.7 Cross over distortion and class AB operation
2.8 Power dissipation and heat sinks

3. Feedback Amplifiers and Oscillators (5 hrs)

3.1 Advantages of Negative feedback amplifiers
3.2 Gain stability and bandwidth extension
3.3 Feedback configurations
3.4 Sinusoidal oscillators
3.5 Importance of positive feedback in oscillator circuits
3.6 Wien-bridge oscillator
3.7 RC phase shift oscillator
3.8 Tuned LC oscillators
3.9 Crystal oscillator

4. Operational Amplifiers (6 hrs)

4.1 Fundamentals of operational amplifiers (Op. Amp)
4.2 Characteristics and features of Op. Amp
4.3 Virtual ground concept, Output offset voltages, input bias current, CMRR and slew rate
4.4 Inverting and non inverting amplifiers
4.5 Applications of op amp in summing, differentiation, and integration
4.6 Instrumentation amplifiers
4.7 Applications of Instrumentation amplifiers
4.8 Isolation amplifiers

5. Instrumentation System and signal measurements (6 hrs)

5.1 Components of Instrumentation and their function
5.2 Units and standards of measurements
5.3 Measuring instruments
5.4 Performance parameters
5.5 Review of Wheat stone, inductance and capacitance bridges
5.6 Error, Probability of errors, Normal distribution

6. Physical Variables and Transducers (8hrs)

6.1 Physical variables and their types (Electrical, Mechanical, Process, bio-physical variable)
6.2 Types, Principle of operation, input and output characteristics and applications of Transducer (resistive, capacitive, inductive, voltage and currents)

7. Signal Conditioning and Processing (6 hrs)

7.1 Importance of signal conditioning
7.2 Interference signals and their elimination
7.3 Importance of signal conversion
7.4 Binary weighted resistor DAC
7.5 R-2R ladder DAC
7.6 Counting type ADC
7.7 Successive type ADC
7.8 Flash ADC

8. Output Devices (3 hrs)

8.1 Indication instruments,
8.2 Magnetic data recorders,
8.3 Strip-chart,
8.4 X-Y recorder

Laboratory:

1. Frequency response of BJT amplifier
2. Efficiency calculation of class A and B power amplifiers
3. Design of RC Phase shift and Wein Bridge Oscillator
4. Realization of a R-2R D/A Converter
5. Conversion of physical variables into electrical signal
6. Signal conditioning using active devices or Op Amp
7. Measurement of physical variables using various Bridges
8. Error measurements in instrumentation system

Text Books:

1. A.K. Sawhney, *A Course in Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons, India, 1998.
2. Theodore F. Bogart, Electronic Devices and Circuits, Universal Book Stall, India.

References:

1. S. Wolf and R.F.M. Smith, *Student Reference Manual for Electronic Instrumentation Laboratories*, Prentice Hall of India, 1996.
2. E.O. Deobelin, *Measurement System: Application and Design*, McGraw Hill, 1990
3. C.S. Rangan, G.R. Sarma, and V.S.V. Mani, *Instrumentation Devices and Systems,* Tata McGraw Hill, India, 1992.
4. D.M. Considine, *Process Instruments and Control Handbooks*, McGraw Hill 1985.
5. Dhruba Banjade, Electronic Circuits, Yog Prakashan 2012.
6. A.D. Helfrick and W.D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, Prentice Hall of India, 1996

MTH 213.2 Probability and Queuing Theory (2-2-0)

Evaluation:

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

Course Objectives:
The purpose of the course is to provide sound knowledge of the probability, probability distributions and queuing theory.

Course Contents:

1. Basic Probability Concepts (4 hrs)
- 1.1 Probability Theory and Sample space
- 1.2 Events and probability approaches
- 1.3 Probability laws; Addition law and Multiplication law
- 1.4 Conditional Probability and Bayes' Rule.

2. Random variable, Mathematical expectation and theoretical distribution (16 hrs)
- 2.1 Concepts of Random variable, Types of random variable
- 2.2 Probability distribution of discrete random variable and continuous random variable
- 2.3 Function of random variable
- 2.4 Mathematical expectation and variance of Continuous and discrete random variable
- 2.5 Moments of continuous random variable, Uses of Moments
- 2.6 Binomial distribution, Poisson distribution
- 2.7 Normal distribution, t-distribution, Chi-square distribution, F-distribution, Beta distribution, Gamma distribution, Exponential distribution
- 2.8 Expectations and Higher Order Moments
- 2.9 Characteristic function
- 2.10 Chebyshev inequality for continuous random variable
- 2.11 Laws of Large Numbers: Weak Laws and Strong Laws of Large Numbers
- 2.12 Central Limit Theorem and its application

3. Queuing Theory (10 hrs)
- 3.1 Essential features of queuing system
- 3.2 Specification and Measure of Queuing System
- 3.3 Probability distribution in queuing system
  - 3.3.1 Distribution of arrival, Pure Birth Process
  - 3.3.2 Distribution of inter-arrival times, distribution of departure, pure death process
- 3.4 Distribution of service time
- 3.5 The Classical System: Operating characteristics (Transient and steady state behavior, Line Length, Queue length, Relationship among System Characteristics)
- 3.6 Solution of Queuing Models: The (M/M/1: α /FCFS) model, (M/M/1: α/SIRO) model. The M/M/1: N/FCFS model, The M/M/s: α /FCFS model. The M/M/s: N/FCFS model,

The M/M/s: M/G/D model, The M/Ek/1: α /FCFS model, Application of Queuing Theory in Computer Science, (Examples and numerical problems)

Text Book:

1. Trivedi, K. S., *Probability & Statistics with Reliability Queuing, and Computer Science Applications*, PHI, 2000, ISBN: 81-203-0508-6

References:

1. Johnson, Rechard A., *Miller & Freund's Probability and Statistics for Engineers*, PHI, Fifth Edition, ISBN: 81-203-0892-1.
2. Sharma, J. K., *Operation Research – Theory and Applications*, McMilan India Ltd. 2000, ISBN: 033-923944.
3. V. Sundarapandain Probability Statistics and Queuing theory, PHI Learning PVT, ISBN: 978-203-3844-9

Database Management System (3-1-3)

Evaluation:

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

Objectives:
The objective of this course is to provide fundamental concept, theory and practices in design and implementation of DBMS.

Course Contents:

1. Introduction (4 hrs)
1.1 Concept and applications
1.2 Objectives and Evolution
1.3 Needs of DBMS
1.4 Data abstraction
1.5 Data independence
1.6 Schema and Instances
1.7 Concept of DDL, DML and DCL
1.8 Database Manager and users

2. Data Models (4hrs)
2.1 Logical, Physical and Conceptual Model
2.2 E-R Model
2.3 Relation with UML class diagrams
2.4 2.4Alternate data models (Network Data Model, hierarchical Data Model)

3. Relational Model (4 hrs)
3.1 Definitions and terminology
3.2 Structure of relational databases
3.3 The relational algebra
3.4 Schema and Views
3.5 Data dictionary

4. Relational Database Query languages (8 hrs)
4.1 SQL – features of SQL, queries and sub-queries, Join operations, set operations and other SQL constructs
4.2 DDL and DML queries in SQL
4.3 Stored procedures
4.4 QBE

5. Database Constraints and Relational Database Design (8 hrs)
5.1 Introduction
5.2 Integrity constraints
5.3 Referential Integrity
5.4 Assertions and Triggers

5.5 Functional dependencies
5.6 Normalization and Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF)
5.7 Multivalued Dependencies
5.8 Decomposition of relation schemes

6. Security **(3 hrs)**
6.1 Needs of security
6.2 Security and integrity violations
6.3 Access control
6.4 Authorization
6.5 Security and Views
6.6 Encryption and decryption

7. Query Processing **(3 hrs)**
7.1 Introduction to query processing
7.2 Equivalence of expressions
7.3 Query cost estimation
7.4 Query Optimization

8. File organization and indexing **(4 hrs)**
8.1 Disks and storage
8.2 Organization of records into blocks
8.3 File organizations - The sequential and the indexed sequential file organizations
8.4 B+ Tree index
8.5 Hash index

9. Crash Recovery **(3 hrs)**
9.1 Failure classification
9.2 Concept of log-based recovery and shadow paging
9.3 Data Backup/Recovery
9.4 Remote backup system

10. Transaction Processing and Concurrency Control **(4 hrs)**
10.1 Introduction to Transactions
10.2 ACID properties of transaction
10.3 Schedules and Serializability
10.4 Concepts of locking for concurrency control

11. Advanced Database concepts **(3 hrs)**
11.1 Object-Oriented Model
11.2 Object-Relational Model (ORM)
11.3 Distributed databases
11.4 Concepts of Data Warehouses

Laboratory:
There shall be enough laboratory exercises based on some RDBMS (like ORACLE, MS-SQL server, MySQL, etc) to complement theoretical part studied. An individual project should be given to each student. 10% of sessional marks should be allocated for evaluation for lab works and project.

Text Book:

H. F. Korth and A. Silberschatz, *Database System Concepts*, McGraw Hill.

Reference Books:

1. K. Majumdar and P. Bhattacharaya, *Database Management Systems*, Tata McGraw Hill, India.
2. R. E. Mani and S. C. Nevathe, *Fundamentals of Database Systems*, Benjamin/Cummings Publishing Co. Inc.
3. G.C Everest, *Database Management*, McGraw Hill.

Engineering Mathematics IV (3-2-0)

Evaluation:

	Theory	Practical	Total
Internal	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

After completion of this course students will be able to

- to explain and apply theorems of complex variables in their required applied problems.
- to apply concepts of Fourier and Z-transform in the signal processing.
- to study wave and diffusion equations in Cartesian, cylindrical, and polar coordinates.

Course Contents:

Unit I: Complex variable **12 hrs**

1.1 Review of complex numbers with their properties
1.2 De Moirves Theorem
1.3 Function of complex variables,
1.4 Conformal mappings
1.5 Analyticity , necessary condition of analyticity
1.6 Cauchy integral theorem, Cauchy integral formula, Extension form of Cauchy integral formula,
1.7 Taylor and Laurent series
1.8 Singularities, zeros, poles, complex integration, residue theorem

Unit II: Z-transform **9 hrs**

2.1 Definition, one sided and two sided z transform
2.2 Linear Time invariant system, Unit impulse function
2.3 Properties of z transform, region of convergence
2.4 Inverse Z transform by residue and partial fraction
2.5 Parseval theorem, convolution
2.6 Application (Solution of difference equation)

Unit III: Fourier Integral and Fourier Transform **7 hrs**

3.1 Fourier series in complex form
3.2 Fourier integral, Sine integral and cosine integral
3.3 Fourier transform, cosine transform, sine transform
3.4 Inverse Fourier transform, Parseval identity
3.5 Convolution theorem and its applications

Unit IV: Partial Differential Equation **14 hrs**

4.1 Definition with examples
4.2 Method of separation of variables

4.3 Derivation and solutions of Wave equations (one and two dimensional) and their applications.
4.4 Wave equation by D Alembert's method
4.5 Derivation and solution of heat equation (one and two dimensional)and their application
4.6 Laplacian equation [Cartesian, polar, cylindrical, spherical form(statement only)], their solutions.
4.7 Engineering applications of partial differential equation.

Unit V: Curve in space **3 hrs**

5.1 Ellipsoid, hyperboloid, Paraboloid, cylinder, cone (Standard equations, their sketch)
5.2 Tangent line and tangent plane on the space curve

Text books:

1. E. Kreyszig, *Advanced Engineering Mathematics*,8th edition Wiley-Easter Publication, New Delhi
2. H. K. Dass & R. Verma, Higher Engineering Mathematics, First edition, S. Chand & Company Limited, New Delhi

Reference Books:

1. Digital Signal Processing: J. G. Proakis, Prentice Hall of India.
2. V Sundaran, R Bala Subramanayam, K. L . Laxminarayanam, *Engineering Mathematics* , Volume II
3. A. V. Oppenheim, *Discrete-Time Signal Processing*, Prentice Hall, India Limited, 1990.
4. K. Ogata, *Discrete-Time Control System*, Prentice Hall, India Limited, 1993.

Microprocessors and Assembly Language Programming (3-1-3)

Evaluation:

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

Course Objectives:
The purpose of the course is to provide the basics fundamentals and operations of microprocessor. It provides knowledge to program microprocessor using assembly language and design microprocessor based systems and interfaces.

Course Contents:

1. Introduction to microprocessor (3 hrs)
- 1.1 Brief description: Microprocessor, Microcontroller, Microcomputer
- 1.2 Application of microprocessor
- 1.3 Evolution of microprocessor: INTEL series

2. Architectural Details and Instruction set of 8085 and 8086 microprocessor (10 hrs)
- 2.1 Internal architecture and description
- 2.2 Instruction set
- 2.3 Addressing modes
- 2.4 Instruction cycle, Machine cycle, t-states
- 2.5 Timing Diagram

3. Assembly Language Programming (12 hrs)
- 3.1 Introduction
- 3.2 Format of an assembly language instruction
- 3.3 Basic assembly language programs of 8085
- 3.4 ALP development tools:Editor,Assembler,Linker,Debuger,Locator,Emulator
- 3.5 Macro Assembler and Assembler Directives
- 3.6 8086 Assembly Language Programs in MASM/TASM
- 3.7 Modular Programming
  - 3.7.1 Linking and Relocation
  - 3.7.2 Stacks Procedures
  - 3.7.3 Macros Program Design
  - 3.7.4 String Manipulation

4. Bus Structure and Memory Devices (4 hrs)
- 4.1 Introduction: Data/Address/Control bus
- 4.2 Synchronous and Asynchronous bus
- 4.3 Memory Classification
- 4.4 Memory Interfacing and Addressing Decoding

5. Interrupt **(6 hrs)**

5.1 Introduction
5.2 Interrupt Sources: Hardware, Software, Processor
5.3 Interrupt Types: Maskable, Non-Maskable Interrupt
5.4 8086 Interrupts
5.5 Interrupt Vector Table
5.6 Vector Chain and Polled Interrupt
5.7 Interrupt Processing

6. Input / Output Interfaces **(10 hrs)**

6.1 Serial I/O standards: 8251A USART
6.2 8259A Programmable Interrupt Controller(PIC)
6.3 8255A Programmable Peripheral Interface(PPI)
6.4 8254 Programmable Interrupt Timer(PIT) and its application
6.5 DMA and DMA controller

Laboratory:

1. A minimum of 10 laboratory exercises shall be done with the use of SDK-85/SDK-86 or equivalent microprocessor trainer kit and Simulators.
2. Numerous assembly language programming exercises are to be done both with the help of microprocessor trainer kit and Macro-Assemblers in PC.

Text Books:

1. Liu. Yu-cheng and Gibson Glenn A., Microprocessor Systems: The 8080 8088 family Architecture. Programming and Design.PHI, 1998. ISBN: 81-203-0409-8
2. Brey. Barry B..Intel Microprocessors.PHI. 1998. ISBN:

References:

1. Antonakos. J. L. An Introduction to the Intel family of microprocessors, 3rded, Pearson Education Asia. ISBN: 81-7808-312-4
2. Triebel, Walter A. and Singh Avvbtar, The 8088 and 8086 microprocessors: Programming Interfacing, Software, Hardware, and Applications PHI. 1998, ISBN
3. L.A Leventhal, Introduction to Microprocessor software, Hardware & Programming Prentice Hall of India. Pvt. Ltd., 1995.
4. A.P. Malvino, An Introduction to Microcomputers. Prentice Hall of India. Pvt. Ltd 1995
5. P.K. Ghosh, P.R. Sridhar, 0000 to 8085;Introduction to Microprocessor for Engineers and Scientists, Prentice Hall of India Pvt. Ltd 1997
6. Rajaraman, V. and Radhakrishnan T., Essentials of Assembly Language Programming for the IBM PC, PHI, 1998. ISBN: 81-203-1425-5

Programming in Java

Evaluation:

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

Course Objectives:

The purpose of the course is to provide the concept of objective oriented programming using Java. It provides sound understanding of network programming and database connectivity. Moreover, it provides front end platform for development of applications.

Course Contents:

1. Elements Of Java Language (3 hrs)

1.1 Java as a Programming tools, Benefits of Java, Historical Background of Java
1.2 A simple Java Program, Data type, Variable, Assignment and Initialization, Operator, String, Control Flow
1.3 Class Method (User Defined Function), Array

2. Object Oriented Programming In Java (9 hrs)

2.1 Introduction to object oriented programming in Java
2.2 Reusability using Existing classes
2.3 Building User defined class, Package
2.4 Inheritance
2.5 Casting Abstract classes
2.6 Access Protection Mechanism
2.7 Reflection
2.8 Designing Inheritance
2.9 Interface, Inner Classes

3. Exception, Stream and I/O (3 hrs)

3.1 Handling Error and Exception, catching Exception, tips on handling Exception, Debugging techniques
3.2 Stream, Zip files Stream, Object Stream
3.3 Handling Files

4. Applets and Application (4 hrs)

4.1 Fundamental concept of Applet, Simple Applet
4.2 Testing Applets, Converting Application to Applets
4.3 Applets HTML tags and Attribute. Pop –UP Windows in Applet
4.4 Multimedia Applets context

5. Events, Handling Events and AWT/Swing (6 hrs)

5.1 Basic of Event handling, AWT Event hierarchy
5.2 Semantics and low level Events in AWT, Event Handling
5.3 Individual Events. Separating GUI and Application code
5.4 Multicasting, Advance Event Handling
5.5 An Introduction of layout management, Text input choice, scroll Bar
5.6 Complex layout management, Menus, Dialog Box

6. Graphics and Images / Animation / Multimedia (5 hrs)

6.1 Introduction to Graphics Programming, creating Closable frames
6.2 Terminating graphics program. Frame layout displaying information in a frame
6.3 Graphics object. Text and fonts, color
6.4 Drawing shapes from lines drawing rectangle and Ovals
6.5 Filling shapes paint mode images

7. Network Programming (8 hrs)

7.1 Networking Basics
7.2 Introduction to Socket
7.3 Socket Programming
7.4 Understanding Port
7.5 Networking Classes in Java
7.6 Creating Own Server and Client in Java
7.7 Creating Multithread Java Server
7.8 URL and URL connection Class

8. Java Database Connectivity (JDBC) (7 hrs)

8.1 Understanding JDBC
8.2 Database Driver
8.3 JDBC-ODBC bridge
8.4 Java Native Driver
8.5 Intermediate Database Access Server
8.6 JDBC API
8.7 Making a JDBC Application
8.8 Using Prepared Statement

References:

1. Dietel H.M and Dietel P.J., Java: How to Program, Third Edition, Pearson Education Asia
2. Naughton Java 2: The Complete Reference, Tata McGraw Hill
3. Balagurusamy E., Programming in Java: 2nd Edition, Tata McGraw Hill

Project I (0-0-3)

Evaluation:

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

Course Objectives:

1. To provide the practical knowledge of project undertaking by focusing on planning, requirements elicitation, design, development and implementation of a project.
2. To provide the knowledge of Programming tools currently used in the market by carrying out a project.
3. To teach students to work and solve problem in a team environment
4. To provide the knowledge to formulate project documentation and oral presentation for his/her project.

Procedures:

The project course requires students to get themselves involved in a group on a proposed task under the direct supervision of the faculty members of their respective department. The project may be selected in consultation with the industries. The project shall be software and or electronic hardware based. The project may be done on any platform. The application shall be on any relevant areas of application e.g. Scientific Applications, Information Systems, Web Applications, Games, Simulations, Hardware based applications.

The project must be started at the beginning of the semester, span through out the semester and finished by the end of that very semester. The project should be undertaken preferably by group of students who will jointly work and implement the project. The project will be assessed by a panel of examiners as appointed by head of the department. Oral examination will be conducted by internal and external examiners as appointed by the college.

Project Work Phases:

The entire project work shall be divided in to three phases and evaluation shall be done accordingly:

First Phase: The students are required to come up with a conceptual framework for their project work which must be documented in the form of a Proposal and presented in front of an examiner in a formal presentation lasting for about 10 minutes, on the date prescribed by the college.
30% of the marks shall be based on the following criteria:

Evaluation Criteria:

Task Accomplished (20%)

- Feasibility Study
- Requirements Analysis and Specification
- Project plan

- Creativity, Innovativeness and Usefulness of the Idea

Documentation (10%)
- Proposal Report
- Estimations
- Time Line

Second Phase: The students are required to show the progress of their work done so far. They must have finished the design phase including the overall system/architectural design and validation scheme. 50% of total mark shall be based on the following criteria:

Evaluation Criteria:

Task Accomplished (40%)
- System/Architectural Design
- Depth of Project work
- Progress
- Level of achievement
- Group/Team Effort
- Ability to propose solutions

Documentation (10%)
- Report organization
- Completeness and consistency of the report
- Validation Criteria
- Organization and analysis of data and results

Third Phase: All students must have finished all phases of their project work including requirements analysis, design, coding, testing on time before Final Project Presentation.

Students must come up with a visible output of the product that they have developed and perform an oral defense of their work in the presence of an external examiner (external to the department or from industries). The final presentation should be conducted on the last week of final semester term.

Evaluation (20%):
- Presentation
- Completeness and Final Output of the Project
- Viva
- Final Project Report

Software Engineering Fundamentals (3-0-3)

Evaluation:

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

Course Objectives:

The purpose of the course is to introduce the concepts and techniques required to direct and control the development of medium to large-scale software, including project management, quality assurance, software process improvement and software metrics. It aims to broaden student's understanding of possible software development paradigms (e. g., structured analysis and design, object-oriented approaches). Moreover, it enables to explore some of the problems of software maintenance.

Course Contents:

l. Software Project Management Concepts (2 hrs)

1.1 Software: Crisis and Myths, Software Process and Process Models

1.2 Process technology, Product and Process. People, Product, Process, Project

2. Software Metrics (3 hrs)

2.1 Measures, Metrics, and Indicators: Software Measurement

2.2 Metrics for software quality, Statistical Quality Control

2.3 Metrics for Small Organizations

3. Software Project Planning and Risk (3 hrs)

3.1 Objectives, Scope, Resources, Project Estimation, Decomposition Techniques

3.2 Empirical Estimation Models, Risk Management Strategies

3.3 Software Risks, Risk Identification, Risk Projection

4. Software Quality Assurance (5 hrs)

4.1 Concepts, Software Quality Assurance

4.2 Software Reviews, Formal Technical Reviews

4.3 Formal Approaches to SQA

4.4 Statistical Quality Assurance. Software Reliability

4.5 ISO 9000 Quality Standards, SQA Plan

5. Software Configuration Management (4 hrs)

5.1 Software Configuration Management, SCM Process

5.2 Identification of Objects in the Software Configuration, Version Control
5.3 Change Control, Configuration Audit
5.4 Status Reporting, SCM Standards

6. Analysis Concepts and Principles (5 hrs)

6.1 Requirements Analysis, Analysis Principles
6.2 Software Prototyping. Specification and Specification Review
6.3 Analysis Modeling: Elements of Analysis Model
6.4 Data Modeling Functional Modeling and Information Flow
6.5 Behavioral Modeling, Structured Analysis- Data Dictionary

7. Design Concepts and Principles (6 hrs)

7.1 Design Process, Principles and Concepts
7.2 Architectural and Component Level Design
7.3 Software Architecture, Data Design, Architectural Styles
7.4 Mapping Requirements into a Software Architecture
7.5 Transform Mapping, Transaction Mapping
7.6 Structured Programming, Comparison of Design Notation

8. Software Testing Techniques and Strategies (7 hrs)

8.1 Testing Fundamentals,
8.2 Test Case Design.
8.3 White Box Testing. Basis Path Testing,
8.4 Control Structure Testing.
8.5 Black-Box Testing. Unit Testing,
8.6 Integration Testing,
8.7 Validation Testing, System Testing

9. Object-Oriented Concepts and Principles (4 hrs)

9.1 Object-Oriented Paradigm
9.2 Object-Oriented Concepts
9.3 Identifying the Elements of an Object Model
9.4 Management of Object-Oriented Software Projects

10. Object-Oriented Analysis and Design (6 hrs)

10.1 Domain Analysis
10.2 Components of the OO Analysis Model
10.3 The OOA Process, Design for Object-Oriented Systems
10.4 The System Design Process
10.5 The Object Design Process
10.6 Design Patterns

Laboratory:

The Laboratory Exercise includes System Analysis, Design, Development, and Testing. Debugging of a small Real Life problem and then attempting to visualize various Software Engineering activities, like Revision Control System, Version Management, Library Building, etc. using some of the Software Engineering Tool or CASE Tool.

Reference Books:

1. Mall. R., Foundations of Software Engineering. PH1. 2000. ISBN: 81-203-1445-
2. Pressman. R. S., Software Engineering a practitioners Approach. 5th Edition. McGraw Hill. 2001. ISBN: 0-07-118458-9
3. Somnterville. I., Software Engineering, 5th Edition. Addison -Wesley. 1995. ISBN: 0-201-43579 -9

Applied Operating System (3-0-3)

Evaluation:

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

Course Objectives:

1. To introduce and apply the fundamentals of computer operating systems concepts including Process Management, Memory and I/O Management, Processor Scheduling, Synchronization, File System etc.
2. To familiarize the students with the design and implementation aspect of an Operating system.

Course Contents:

1. Operating Systems Types and Structure (5 hrs)

1.1 Introduction
- 1.1.1 Batch Systems
- 1.1.2 Time-Sharing Systems
- 1.1.3 Personal-Computer Systems
- 1.1.4 Parallel Systems
- 1.1.5 Real-Time Systems
- 1.1.6 Distributed Systems

1.2 Operating-System Structures
- 1.2.1 System Components
- 1.2.2 OS Services
- 1.2.3 System Calls
- 1.2.4 System Programs
- 1.2.5 System Structure
- 1.2.6 System Design and Implementation
- 1.2.7 System Generation.

2. Process/Thread Management (15 hrs)

2.1 Processes
- 2.1.1 Concept and Scheduling
- 2.1.2 Operations on Processes
- 2.1.3 Cooperating Processes
- 2.1.4 Inter process Communication

2.2 Threads
- 2.2.1 Overview
- 2.2.2 Benefits of Threads
- 2.2.3 User and Kernel Threads
- 2.2.4 Multithreading Models

2.3 Processor Scheduling
- 2.3.1 Concepts
- 2.3.2 Scheduling Criteria
- 2.3.3 Scheduling Algorithms

2.3.3.1 First Come First Served Scheduling (FCFS)
2.3.3.2 Optimal Scheduling
2.3.3.3 Round Robin Scheduling
2.3.3.4 Shortest Job First (SJF)
2.3.3.5 Shortest-Remaining-Time First scheduling (STRF)
2.3.3.6 Priority Scheduling
2.3.3.6 Multiple Queue Scheduling
2.3.3.7 Multilevel Feedback Queue Scheduling
2.3.4 Thread Scheduling
2.4 Process Synchronization
2.4.1 Background
2.4.2 Critical-Section Problem
2.4.3 Two-Tasks Solutions
2.4.4 Synchronization Hardware
2.4.5 Semaphores
2.4.6 Classical Synchronization
2.4.8 OS Synchronization
2.5 Deadlocks
2.5.1 Model of Deadlocks
2.5.2 Deadlock Characterization
2.5.3 Deadlock Handling Methods
2.5.3.1 Deadlock Prevention
2.5.3.2 Deadlock Avoidance
2.5.3.3 Deadlock Detection
2.5.3.4 Recovery from Deadlock

3. Memory Management (8 hrs)

3.1 Memory Management
3.1.1 Concept
3.1.2 Swapping
3.1.3 Contiguous Memory Allocation
3.1.4 Paging
3.1.5 Segmentation
3.1.6 Segmentation with Paging
3.2 Virtual Memory
3.2.1 Concept
3.2.2 Demand Paging
3.2.3 Page Replacement
3.2.4 Allocation of Frames
3.2.5 Thrashing

4. I/O Management (12 hrs)

4.1 I/O Sub-Systems
4.1.1 Concept
4.1.2 Application I/O Interface
4.2.2 Kernel I/O Subsystem
4.2.3 I/O Requests Handling
4.3.4 Performance
4.2 Mass-Storage Device

4.2.1 Disk Structure and Data Organization on Disk
4.2.2 Disk Scheduling
4.2.3 Disk Management
4.3.4 Swap-Space Management
4.3.5 Stable-Storage Implementation
4.3.6 Tertiary-Storage Structure
4.3.7 I/O in UNIX

5. File Systems **(5 hrs)**

5.1 Concept
5.2 File Access Methods
5.3 Writing and Seeking
5.4 Directory Structure
5.5 Protection
5.6 File-System Structure
5.7 Methods of Allocation
5.8 Free-Space Management
5.9 Directory Implementation
5.10 Recovery

Laboratory:

The laboratory work shall focus on the implementation aspect of the concepts covered in the lecture class using Java programming language and a particular platform/OS (e.g. Linux)
These include implementation of Threads, Scheduling of Threads, Synchronization, Deadlock handling in Java. Implementation of Memory, I/O and Resource Management schemes of an Operating System.

Text Book:

Silberschatz, A., Galvin, P.B., Gagne, G., *Applied Operating Systems Concepts*, 1st Edition, John Wiley & Sons, 2000, ISBN: 9971-51-284-X

Reference:

Silberschatz, A., Galvin, P.B., *Operating Systems Concepts*, 5th Edn., John Wiley & Sons, 1999, ISBN: 9971-51-275-0

Computer Organizations and Architecture (3-1-2)

Evaluation:

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

Course Objectives:

Undergoing this course will help a student to build up a sound background in understanding the fundamentals of organization of the Computer System and the associated components. This course exposes a student to the modem trends and technology behind computer organization in a practical perspective with examples taken from real world.

Course Contents:

1 Instruction Set Architecture. (2 hrs)

1.1 Levels of Programming Language
1.2 Language Category, Compiling and Assembling Programs
1.3 Assembly Language Instructions
1.4 Instruction Type, Data Types, Addressing Modes, Instruction Formats
1.5 Instruction Set Architecture Design

2 Computer Organization (6 hrs)

2.1 Basic Computer Organization
2.2 System Buses
2.3 Instruction Cycles
2.4 CPU Organization
2.5 Memory Sub-system Organization and Interfacing
2.6 I/O Sub-system Organization and interfacing

3 RTL and HDL (4 hrs)

3.1 Micro-Operations and RTL
3.2 Using RTL to specify a Digital System
3.3 Specification of Digital Component,
3.4 Specification and Implementation of Simple System.
3.5 Introduction to VHDL: Syntax, Levels of Abstraction in Design

4 CPU Design (7 hrs)

4.1 Specification of a CPU
4.2 Design and Implementation of a Very Simple and Relatively Simple CPU
4.3 Instruction Execution, Fetch, Decode, Data Path
4.4 ALU Design
4.5 Designing Hardwired Control Unit
4.6 Design Verification

5 Control Unit Design (4 hrs)

5.1 Basic Micro-sequencer (Control Unit) Design and Operations
5.2 Micro-instruction Formats
5.3 Design and Implementation of a Very Simple Micro-sequencer
5.4 Control Unit: Layout, Control Sequence Generation, Mapping Logic
5.5 Generation of Micro-Operations using Horizontal and Vertical Microcode
5.6 Directly Generating the Control Signals from the Microcode
5.7 Reducing tile Number of Micro-Instructions
5.8 Micro-programmed vs. Hardwired Control Unit

6 Arithmetic Unit (6 hrs)

6.1 Representations of Binary Number and Arithmetic in Unsigned Notation
6.2 Addition and Subtraction in Unsigned Notation
6.3 Multiplication in Unsigned Notation, Shift Add Multiplication Algorithm, Booth's Algorithm
6.4 Division in Unsigned Notation, Shift Subtract Division Algorithm
6.5 Signed Notation
6.6 Addition and Subtraction in Signed Notation
6.7 Binary Coded Decimal (BCD), BCD Numeric Format, BCD Addition
6.8 Specialized Arithmetic Hardware: Lookup ROM, Wallace Tree, Arithmetic Pipeline
6.9 Floating Point Numbers, Numeric Format
6.10 IEEE 754 Floating Point Standard, Numeric Format

7 Memory Organization (4 hrs)

7.1 Hierarchical Memory System
7.2 Cache Memory: Associative Memory
7.3 Cache Mapping with Associative, Direct and Set-Associative Mapping
7.4 Replacing Data in Cache, Writing Data to the Cache, Cache Performance Basics
7.5 Virtual Memory: Paging, Segmentation, and Memory Protection

8 Input /Output Organization (6 hrs)

8.1 Asynchronous Data Transfer
8.2 Modes of Asynchronous Data Transfer
8.3 Programmed I/O
8.4 Interrupts, Interrupts Driven Data Transfer. Types of Interrupts, Interrupts Processing, Interrupt Hardware and Priority
8.5 Direct Memory Access (DMA), DMA Transfer Modes,I/O Processors
8.6 Serial Communication, UART
8.7 USB Standards

9 Introduction to RISC (3 hrs)

9.1 RISC Fundamentals, RISC Instruction Set
9.2 Instruction Pipeline, Register Windows and Renaming
9.3 Conflicts in Instruction Pipeline: Data Conflicts, Branch Conflicts
9.4 RISC vs. CISC

10 Introduction to Parallel Processing (3 hrs)

10.1 Parallelism in Uniprocessor System

10.2 Organization of Multi-Processor System: Flynn's Taxonomy, System Topologies, MIMD System Architectures

10.3 Communication in Multi-Processor Systems: Fixed Connections and Reconfigurable Connections

10.4 Memory Organization in Multi-processor System: Shared Memory, Cache Coherence

Laboratory

Develop a project or a case study report in the field of computer Organization. The faculty concerned will provide the topic of the project work. Anoral presentationwith a demonstration in case of project should be part of work with submission of report as a component for evaluation.

Few topics of case study could be:

1. 8085/8086 Instruction Set Architecture
2. Internal Architecture of 8085/8086 Microprocessors
3. Micro-coded CPU in a Pentium Processor
4. Cache hierarchy in Itanium Processor
5. Addressing Modes in Power PC Processor
6. Parallel Processing abilities of Dual Core and Quad Core Processor
7. Advanced Features of Atom Processor
8. Systolic Arrays
9. Neural Networks

Text Book:

Carpineili, John D., *Computer System Organization and Architecture*, Addison Wesley. Pearson Education Asia (LPE.), 2001

References:

1. Hayes, John P., McGraw-Hill, Third Edition, 1998
2. W.Stalling, and Architecture, Prentice Hall India Limited. New Delhi.
3. Tanebaum, A.S., *Structured Computer Organization*, Prentice Hall India Limited, New Delhi, Fourth Edition, 1999

Numerical Methods (3-1-3)

Evaluation:

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

Course Objectives:

1. To introduce numerical methods for interpolation, regressions, and root finding to the solution of problems.
2. To solve elementary matrix arithmetic problems analytically and numerically.
3. To find the solution of ordinary and partial differential equations.
4. To provide knowledge of relevant high level programming language for computing, implementing, solving, and testing of algorithms.

Course Contents:

1. Solution of Nonlinear Equations (10 hrs)

1.1 Review of calculus and Taylor's theorem
1.2 Errors in numerical calculations
1.3 Bracketing methods for locating a root, initial approximation and convergence criteria
1.4 False position method, secant method and their convergence, Newton's method and fixed point iteration and their convergence.

2. Interpolation and Approximation (7 hrs)

2.1 Lagrangian's polynomials
2.2 Newton's interpolation using difference and divided differences
2.3 Cubic spline interpolation
2.4 Curve fitting: least squares lines for linear and nonlinear data

3. Numerical Differentiation and Integration (5 hrs)

3.1 Newton's differentiation formulas
3.2 Newton-Cote's, Quadrature formulas
3.3 Trapezoidal and Simpson's Rules
3.4 Gaussian integration algorithm
3.5 Romberg integration formulas.

4. Solution of Linear Algebraic Equations (10 hrs)

4.1 Matrices and their properties
4.2 Elimination methods, Gauss Jordan method, pivoting
4.3 Method of factorization: Dolittle, Crout's and Cholesky's methods
4.4 The inverse of a matrix
4.5 Ill-Conditioned systems
4.6 Iterative methods: Gauss Jacobi, Gauss Seidel, Relaxation methods
4.7 Power method.

5. Solution of Ordinary Differential Equations (8 hrs)

5.1 Overview of initial and boundary value problems
5.2 The Taylor's series method
5.3 The Euler Method and its modifications
5.4 Huen'smethod
5.5 Runge-Kuttamethods
5.6 Solution of higher order equations
5.7 Boundary Value problems: Shooting method.

6. Solution of Partial Differential Equations (5 hrs)

6.1 Review of partial differential equations
6.2 Elliptical equations, parabolic equations, hyperbolic equations and their relevantexamples.

Laboratory:

Use of Matlab/Math-CAD/C/C++or any other relevant high level programming language for applied numerical analysis. The laboratory experiments will consist of program development and testing of:

1. Solution of nonlinear equations
2. Interpolation, extrapolation, and regression
3. Differentiation and integration
4. Linear systems of equations
5. Ordinary differential equations (ODEs)
6. Partial differential equations (PDEs)

Text Books:

1. Gerald, C. F. & Wheatly, P. O. *Applied Numerical Analysis* (7^{th} edition).New York: Addison Wesley Publidhing Company.
2. Guha, S. & Srivastava, R. *Numerical Methods: For Engineers and Scientists*. Oxford University Press.
3. Grewal, B. S. & Grewal, J. S. *Numerical Methods in Engineering & Science (*8^{th}edition). New Delhi: Khanna publishers. 2010.
4. Balagurusamy, E. *Numerical Methods*. New Delhi: TataMcGraw Hill. 2010.

References:

1. Moin, Parviz. *Fundamentals of Engineering Numerical Analysis*. Cambridge University Press, 2001.
2. Lindfield, G. R. & Penny, J. E. T. *Numerical Methods: Using MATLAB*. Academic Press. 2012.
3. Schilling, J. & Harris, S.L. *Applied Numerical Methods for Engineers using MATLAB and C*. Thomson publishers, 2004.
4. Sastry, S. S. *Introductory Methods of Numerical Analysis* (3^{rd} edition). New Delhi: Prentice Hall of India. 2002.
5. Rao, S. B. & Shantha, C. K. *Numerical Methods with Programs in Basic, Fortran and Pascal*. Hyderabad: Universities Press. 2000.
6. Pratap, Rudra. *Getting Started with MATLAB*. Oxford University Press. 2010.
7. Vedamurthy, V.N. & Lyengar, N. *Numerical Methods*. Noida: Vikash Publication House. 2009.

Organization and Management (2-0-0)

Evaluation:

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

Course Objectives:
To make the students able to understand and analyze the professional environment where they have to practice their profession. This course will also help them in bringing attitudinal as well as behavioral change.

Course Contents:

1 Introduction (2 hrs)

1.1 Meaning and concept of management
1.2 Functions of management
1.3 Scope and application of management
1.4 Importance of management

2 Organization (4 hrs)

2.1 Meaning and concept of organization
2.2 Characteristics of organization
2.3 Principles of organization
2.4 Formal and informal organizations
2.5 Organization chart
2.6 Types of organization-line
    2.6.1 Line and staff
    2.6.2 Functional and matrix.
2.7 Authority and responsibility and their interrelationships.

3 Motivation and Leadership (6 hrs)

3.1 Concept of motivation
3.2 Incentives
3.3 Theories of motivation: Need hierarchy, Dual Factoral, Expectancy and Achievement theories.
3.4 Leadership styles: Participative management, Management by objectives, management by exception,
3.5 Learning organizations

4 Human Resource Management (6 hrs)

4.1 Meaning and functions of human resource management
4.2 Recruitment
4.3 Job analysis, Job specification, Job description
4.4 Elements of compensation

4.5 Human resource development: Training (on the job and off the job)
4.6 Performance appraisal

5 Introduction to Industrial Relations (6 hrs)

5.1 Meaning of Industrial Relations
5.2 Trade union
  5.2.1 Collective bargaining
  5.2.2 Trade union movement in Nepal
5.3 Employee grievances
5.4 Employee Discipline
5.5 Employee health and safety
5.6 Compensation and its relation with industry
5.7 Challenges of industrial relations in Nepal
5.8 Methods of improving industrial relations in Nepal

6 Human Behavior and Conflict Management (7 hrs)

6.1 Concept of Human Behavior and Conflict Management
6.2 Types of Conflict Management
6.3 Conflict Management and its impact to the HRM
6.4 Modes of Conflict Management
  6.4.1 Negotiation
  6.4.2 Facilitation
  6.4.3 Mediation
  6.4.4 Arbitration
  6.4.5 Legal action

References:

1. Harold Koontz and Heinz Weihrich, Essentials of Mangement
2. Govinda Ram Agrawal, Organization and Management in Nepal.
3. C.B Mamoria, Personnel Managemnt
4. Fred Luthans Organizational Behavior, (McGraw Hill)

Principles of Communication (3 – 0 – 2)

Evaluation:

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

Course Objectives:

1. The student should become familiar with basic principles and the technology behind communication, common terminology, concepts, equipment and techniques of signal processing for communications.
2. The student should be able to analyze the performance of various modulation methods for analogue and digital transmission, evaluate the effect of noise on signal reception and assemble signal processing modules to implement communications systems.

Course Contents:

1. Introduction (5 hrs)

1.1 Digital and Analog Sources and Systems
1.2 Deterministic and Random Waveforms
1.3 Block Diagram of a Communication System
1.4 Propagation of Electromagnetic Waves
1.5 Information Measure, Channel Capacity and Ideal Communication Systems
1.6 Coding

2. Signals and Spectra (7 hrs)

2.1 Properties of Signals and Noise
2.2 Fourier Transform and Spectra
2.3 Power Spectral Density and Auto-correlation Function
2.4 Orthogonal Series Representation of Signals and Noise
2.5 Fourier Series
2.6 Review of Linear Systems, Band limited Signals and Noise
2.7 Discrete Fourier Transform
2.8 Bandwidth of Signals.

3. Base-band Pulse and Digital Signaling (8 hrs)

3.1 Introduction
3.2 Pulse Amplitude Modulation
3.3 Pulse Code Modulation
3.4 Digital Signaling
3.5 Line Codes and Spectra
3.6 Inter-symbol Interference
3.7 Differential Pulse Code Modulation & Delta Modulation
3.8 Time Division Multiplexing
3.9 Packet Transmission System

3.10 Pulse Time Modulation: Pulse Width Modulation and Pulse Position Modulation

4. **Principles of Signaling and Circuits** **(8 hrs)**

4.1 Complex Envelope Representation of Bandpass Waveforms
4.2 Representation of Modulated Signals
4.3 Spectrum of Bandpass Signals
4.4 Evaluation of Power
4.5 Bandpass Filtering and Linear Distortion
4.6 Bandpass Sampling Theorems
4.7 Received Signal plus Noise
4.8 Classification of Filters and Amplifiers
4.9 Nonlinear Distortion
4.10 Limiters, Mixers, Up Converters, and Down Converters
4.11 Frequency Multipliers: Detector Circuits, Phase-Locked Loops and Frequency Synthesizers
4.12 Direct Digital Synthesis, Transmitters and Receivers.

5. AM, FM, and Digital Modulated System **(9 hrs)**

5.1 Amplitude Modulation
5.2 AM Broadcast Technical Standards
5.3 Double Sideband Suppressed Carrier
5.4 Costas Loop and Squaring Loop
5.5 Asymmetric Sideband Signals
5.6 Phase Modulation and Frequency Modulation
5.7 Frequency Division Multiplexing and FM Stereo
5.8 FM Broadcast Technical Standards
5.9 Binary Modulated Bandpass Signaling
5.10 Multilevel Modulated Bandpass Signaling
5.11 Minimum Shift Keying (MSK) and GMSK
5.12 Orthogonal Frequency Division Multiplexing (OFDM)
5.13 Spread Spectrum Systems.

6. Wire and Wireless Communication Systems **(8 hrs)**

6.1 The Explosive Growth of Telecommunications
6.2 Telephone Systems
6.3 Digital Subscriber Lines (DSL)
6.4 Capacities of Public Switched Telephone Networks
6.5 Satellite Communication Systems
6.6 Link Budget Analysis
6.7 Fiber Optic Systems
6.8 Cellular Telephone Systems
6.9 Television.

Laboratory Experiments:
The student will make use of MATLAB programming language for designing, analyzing and simulating various communication systems using personal computer (PC). The students should perform case studies related to the above mentioned topics.

Text Book:
Couch 11, L. W., *Digital and Analog Communication Systems*, Sixth Edition, 2001, Pearson Education Asia, ISBN: 81-7808-328-0.

References:

1. S. Haykin, *An Introduction to Analog and Digital Communication*, Wiley, New York, 1989.
2. B.P. Lathi, *Modern Analog and Digital Communication Systems*, Prism Book Pvt. Ltd.
3. Kolimbiris, H., *Digital Communication Systems*, 2000, Pearson Education Asia, ISBN: 817808-332-9.
4. S. Haykin, *Digital Communication*, John Wiley

Signal System and Processing (3 – 0 – 2)

Evaluation:

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

Course Objective:
To impart the in-depth knowledge of digital signal processing techniques and applications.

Course Contents

1. Introduction to discrete time signals and systems 8 hrs

1.1 Discrete time signal, basic signal types
1.2 Energy signal, power signal
1.3 Periodicity of discrete time signal
1.4 Transformation of independent variable
1.5 Discrete Time Fourier series and properties
1.6 Discrete time Fourier transform and properties
1.7 Discrete time system properties
1.8 Linear time invariant (LTI) system sum, properties of LTI system
1.9 Frequency response of LTI system
1.10 sampling of continuous time signal, spectral properties of sampled signal.

2. Z-Transform: 4 hrs

2.1 Definition of the Z-transform
  2.1.1 Relationship to convolution summation
  2.1.2 One-sided and two-sided transforms
2.2 Left-sided, right-sided and two-sided sequences, region of convergence, relationship to causality
2.3 Inverse Z-transform- by long division, by partial fraction expansion
2.4 Z-transform properties - delay, advance, convolution, Parseval's theorem

3. Analysis of LTI system in frequency domain 6 hrs

3.1 Frequency response of LTI system, response to complex exponential
3.2 Linear constant coefficient, difference equation and corresponding system function
3.3 Relationship of frequency response to pole-zero of system
3.4 Linear phase of LTI system and its relationship to causality

4. Discrete filter structures 8 hrs

4.1 FIR filter
4.2 Structures for FIR filter
  4.2.1 Direct form
  4.2.2 Cascade
  4.2.3 Frequency sampling

4.2.4 Lattice

4.3 IIR filter

4.4 Structures for IIR filter

4.4.1 Direct form I and Direct Form II

4.4.2 Cascade

4.4.3 Lattice and Lattice ladder

4.5 Quantization effect

4.5.1 Truncation, rounding

4.5.2 Limit cycles

4.5.3 Scaling

5. IIR Filter Design: 6 hrs

5.1 IIR filter design by transformation

5.1.1 Impulse- invariance method

5.1.2 Bilinear transformation

5.2 Design of digital low pass Butterworth filter

5.3 Properties of

5.3.1 Chebyshev filter

5.3.2 Elliptical filter

5.3.3 Bessel filter

5.4 Spectral transformations

6. FIR Filter Design: 6 hrs

6.1 FIR filter design by Window functions

6.1.1 Rectangular

6.1.2 Hanning

6.1.3 Hamming

6.1.4 Kaiser Windows

6.2 FIR filter design by the frequency sampling method

6.3 FIR filter design by using the Remez exchange algorithm

7. The Discrete Fourier Transform: 7 hrs

7.1 The discrete Fourier transforms (DFT) derivation, Inverse DFT

7.2 Properties of the DFT

7.2.1 Linearity

7.2.2 Time shift

7.2.3 Frequency shift

7.2.4 Conjugation and conjugate symmetry

7.2.5 Duality

7.2.6 Convolution

7.2.7 Multiplication

7.3 Circular convolution

7.4 Introduction of the Fast Fourier Transform (FFT), divide and conquer approach of FFT computation, Radix-2

Laboratory:

1. Introduction to digital signals - sampling properties, aliasing, simple digital notch filter behavior
2. Response of a recursive (11R) digital filter - comparison to ideal unit sample and frequency responses, coefficient quantization effects
3. Scaling, dynamic range and noise behavior of a recursive digital filter, observation of nonlinear finite precision effects.
4. Response of a non-recursive (FIR) digital filter order band pass filters implemented using cascaded second order sections and wave or ladder filters, comparison of implementations
5. Use of DFT and FFT transforms

Text Book:

A. V. Oppenheim, "Discrete-Time Signal Processing", Prentice Hall, 1990.

References:

1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing Prentice Hall of India.
2. S. K. Mitra, Digital signal processing. A Computer based approach, Mc Graw Hill.

Computer Graphics (3 – 1 – 2)

Evaluation:

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

Course Objectives:

1. To provide the knowledge of basic techniques used in Computer Graphics Systems.
2. To provide the knowledge of 2D and 3D algorithms used in Computer Graphics Systems.

Course Contents:

1. Introduction **2 hrs**

1.1 Introduction
1.2 History of Computer Graphics
1.3 Application of Computer Graphics

2. Graphics Hardware **6 hrs**

2.1 Interactive Input Devices
2.2 Display Devices and Hard Copy Devices
2.3 Raster and Random Systems and Architectures
2.4 Video Controller
2.5 Use of Digital to Analog Converter and Frame Buffer Organization
2.6 Color Monitors

3. Two Dimensional Algorithms **7 hrs**

3.1 Line Drawing Algorithms
3.1.1 DDA
3.1.2 Bresenham's Algorithm
3.2 Circle Generation Algorithm
3.3 Ellipse Generation Algorithms
3.4 Area Filling-Scan Line Algorithm
3.5 Boundary Fill Techniques
3.6 Flood Fill Techniques

4. Two Dimensional Geometric Transformations and Viewing **8 hrs**

4.1 Basic Transformations
4.2 Other Transformations
4.3 Homogeneous Co-ordinate systems
4.4 Composite Transformations
4.5 Windowing Concepts
4.6 Viewing Pipeline
4.7 Window to View port Transformation

4.8 Line Clipping Algorithm: Cohen-Sutherland
4.9 Polygon Clipping: Sutherland-Hodgeman

5. Three Dimensional Graphics Systems **7 hrs**

5.1 3D Co-ordinate System and 3D Transformations
5.2 3D Representations
5.3 Polygon Surfaces
5.4 Cubic Spline and Beizer Curve
5.5 Non-Planer Surface: Bezier Surface
5.6 Fractal Geometry Method
5.7 3D Viewing Transformation
5.8 Projection Methods: Parallel and Perspective
5.9 Clipping in 3D

6. Visible Surface Detection **5 hrs**

6.1 Hidden Surfaces and their Removal Techniques
6.2 Back-Face Detection
6.3 Depth Buffer Method
6.4 A- buffer method
6.5 Scan Line Method
6.6 Area Subdivision Method
6.7 Depth Sorting Method

7. Illumination and Shading **6 hrs**

7.1 Illumination Theory
7.2 Ambient Light
7.3 Reflections: Diffuse, Specular
7.4 Surface Shading methods
  7.4.1 Constant Shading
  7.4.2 Gouraud Shading
  7.4.3 Phong Shading
  7.4.4 Fast Phong Shading
7.5 Color Models: RGB, CMYK

8. Graphical Languages **4 hrs**

8.1 Need for Machine Independent Graphical Languages
8.2 Graphical Languages: PHIGS, GKS
8.3 Graphics Software Standard
8.4 Overview of Graphics File Formats
8.5 Data Structure in Computer Graphics
8.6 Introduction to OpenGL

Laboratory:
Implementation of various 2D and 3D graphics algorithms covered in the course using C / C++ and OpenGL.

Text Book:

Donald Hearn and M. Pauline Baker: *Computer Graphics*, Prentice-Hall.

References:

1. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, *Computer Graphics: Principles and Practice in C*, Addison-Wesley.
2. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner, *Open GL Programming Guide* Third Edition, The Official Guide to Learning OpenGL, Version 1.2, OpenGL Architecture Review Board, LPE Pearson Edition Asia.

Computer Networks (3 – 0 - 2)

Evaluation:

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

Course Objectives:

This course provides the overall communication infrastructure including wired and wireless media for computer networking, models of network. It also highlights the operation of layer-wise network communication, different addressing mechanisms, routing algorithms, security in the computer network and overview of server configuration for complete networking systems.

Course Contents:

1. Introduction to Computer Network **3 hrs**

1.1. Definition, merits, Demerits
1.2. Network Models
  1.2.1. PAN, LAN, Campus Area Network (CAN), MAN, Country Area Network (CAN*), WAN, GAN.
  1.2.2. Topological Models (star, bus, distributed bus, mesh, tree, hybrid, ring)
  1.2.3. Client/Server, Peer-to-Peer & Active Network Model

2. Reference Model **4 hrs**

2.1. Protocols and Standards
2.2. Interfaces and Services
2.3. OSI Layers
2.4. TCP/IP layers
2.5. Comparison of OSI & TCP/IP
2.6. Networking hardware: NIC, Hub, Repeater, Switches, Bridge, Router

3. Physical Layer **4 hrs**

3.1. Guided Media: Copper, Fiber cabling and its capacity standards
3.2. Unguided Media: Bluetooth, Wi-Fi/Wireless-LAN, Satellite Communication Basics (Micro waves, Radio waves)
3.3. Circuit/packet/message switching
3.4. ISDN Signaling & Architecture
3.5. Network Performance: Bandwidth, Throughput, Latency, Bandwidth-Delay Product, Jitter

4. Data Link Layer **8 hrs**

4.1. LLC and MAC sub-layer overview
4.2. Physical (MAC) addressing overview
4.3. Framing
4.4. Flow control (stop and wait, go-back-N, selective-repeat-request)
4.5. Error Control Mechanisms
  4.5.1. Error Detection: Parity Check, CRC

4.5.2. Error Correction: Hamming code
4.6. Channel Access
4.6.1. ALOHA Systems
4.6.2. CSMA, CSMA/CD
4.7. 802.3 Ethernet, Fast Ethernet, Gigabit Ethernet
4.8. 802.4 Token Bus, 802.5 Token Ring
4.9. Virtual Circuit Switching: Frame Relay, ATM & X.25

5. Network/Internet Layer Protocols and Addressing **8 hrs**
5.1. Logical addressing
5.1.1. IPv4 addressing, subnetting, supernetting, CIDR, VLSM
5.1.2. IPv6 addressing overview
5.1.3. IPv4 and IPv6 header protocol format
5.1.4. IPv4 & IPv6 feature comparison
5.2. Routing Algorithm overview
5.2.1. Classful and Classless Routing
5.2.2. Adaptive and non-adaptive routing
5.2.3. Distance vector and link-state routing
5.2.4. Interior and exterior routing
5.2.5. Unicast & multicast routing
5.2.6. Routing Algorithms: RIP, OSPF, BGP

6. Transport Layer and protocols **4 hrs**
6.1. Port addressing overview
6.2. Process to process delivery: multiplexing and de-multiplexing
6.3. TCP services, features, segment headers, well known ports & Handshaking
6.4. UDP Services, features, segment Headers, well known ports
6.5. Concept of Socket programming: TCP & UDP socket

7. Congestion Control & Quality of services **3 hrs**
7.1. Congestion Control: Open loop and Closed Loop
7.2. Traffic Shaping (leaky bucket and token bucket)
7.3. TCP congestion control

8. Application Layer, Servers & Protocols **5 hrs**
8.1. Domain addressing, DNS server & Queries
8.2. HTTP, FTP & proxy server overview.
8.3. DHCP principles.
8.4. E-mail server Protocol: SMTP, POP, IMAP

9. Network management and Security **6 hrs**
9.1. Introduction to Network management.
9.2. SNMP
9.3. Principles of cryptography (Symmetric key: DES, Asymmetric key: RSA)
9.4. Key Exchange Protocols (Diffie-Hallman, Kerberos)
9.5. VPN
9.6. Overview of IPSEC
9.7. Firewall & its types

Laboratory Work:

1. Network commands testing: ping-pong, netstat, nslookup, ipconfig/ifconfig, tracert/traceroute…
2. Setting up Client/Server network system in Microsoft and Linux environment
3. UTP CAT6 cabling: Straight and Cross wiring, testing and verification
4. Internet Packet header analysis using TCPDUMP/WIRESHAK
5. Router Configuration, use of packet tracer or other simulator software
6. OSPF configuration & practices
7. Web, Proxy, FTP server configuration
8. Implementation of Router ACL, Proxy Firewall, IPTables.
9. Case Study: Network Design Standards (eg: building Network design with servers including NCR)

Text Book:

Behrouz A. Forouzen, "Data Communication and Networking", 4th Edition, Tata McGgaw Hill.

References:

1. A.S. Tanenbaum, “Computer Networks”, 3rd Edition, Prentice Hall India, 1997.
2. W. Stallings, “Data and Computer Communication”, Macmillan Press, 1989.
3. Kurose Ross : Computer Networking: A top down approach, 2nd Edition, Pearson Education

Information Systems (3 – 0 – 2)

Evaluation:

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

Course Objectives:

The objective of this course is to introduce and apply the knowledge of computer based information systems. It also provides the concept to the student in designing and setting up complex information system.

Course Contents:

1. Information System **3 hrs**

1.1. Classification and evolution of IS
1.2. IS in functional area.
1.3. Information system architecture
1.4. Qualities of information systems
1.5. Managing Information System resources
1.6. Balanced Scorecard – case studies

2. Control, Audit and Security of Information System **3 hrs**

2.1. Control of information system
2.2. Audit of information system
2.3. Security of information system
2.4. Consumer layered security strategy
2.5. Enterprise layered security strategy
2.6. Extended validation and SSL certificates
2.7. Remote access authentication
2.8. Content control and policy based encryption
2.9. Example of security in e-commerce transaction

3. Enterprise Management Systems **8 hrs**

3.1. Enterprise management systems (EMS)
3.2. Enterprise Software: ERP/SCM/CRM
3.3. Information Management and Technology of Enterprise Software
3.4. Role of IS and IT in Enterprise Management
3.5. Enterprise engineering, Electronic organism, Loose integration vs. full Integration, Process alignment, Frame work to manage integrated Change, future trends.

4. Decision Support and Intelligent Systems **7 hrs**

4.1. DSS, operations research models
4.2. Group decision support systems

4.3. Enterprise and executive decision support systems
4.4. Knowledge Management, Knowledge based Expert system
4.5. AI, Neural Networks, Virtual reality, Intelligent Agents
4.6. Data mining, Data ware Housing, OLAP, and OLTP
4.7. Anomaly and fraud detection

5. Planning for IS **3 hrs**

5.1. Strategic information system
5.2. Tactical information system
5.3. Operational information systems

6. Implementations of Information Systems **9 hrs**

6.1. Change Management
6.2. Critical Success Factors
6.3. Advanced Balanced scorecard

- Advanced strategic foundations development
- Advanced objective & strategy map development
- Advanced performance management
- Implementation & visualization
- Strategic initiative prioritization & management
- Advanced scorecard alignment & cascading
- Dashboard

7. Web Based Information System and Navigation **6 hrs**

7.1. The structure of the web
7.2. Link Analysis
7.3. Searching the web
7.4. Navigating the web
7.5. Web uses mining
7.6. Collaborative filtering
7.7. Recommender systems
7.8. Collective intelligence

8. Scalable and Emerging Information System Techniques **6 hrs**

8.1. Techniques for voluminous data
8.2. Cloud computing technologies and their types
8.3. Map Reduce and Hadoop systems
8.4. Data management in the cloud
8.5. Information retrieval in the cloud
8.6. Link analysis in cloud setup
8.7. Case studies of voluminous data

Practical:

The practical exercise shall include following three types of projects ondesigning of information system

1. E-commerce based information system for online transaction processing

2. Web uses mining or collaborative filtering based processing system
3. Scalable and emerging information system
4. Balanced scorecard, Strategy Map

References:

1. Information Systems Today Leonard Jessup and Joseph Valacich, Prenticehall, 2007
2. Managing with Information System, J.Kanter, PHI, Latest edition
3. An Introduction to Search Engines and Web Navigation, M. Levene, Pearson Education,
4. Data-Intensive Text Processing with Map Reduce, Jimmy Lin and Chris Dyer, Morgan and Claypool, 2010.
5. The Cloud at Your Service, Jothy Rosenberg and Arthur Mateos, Manning, 2010
6. Balanced scorecard: Robert S. Kaplan, David P. Norton
7. Strategy Maps: Converting intangible assets into tangible outcomes, Robert S. Kaplan, David P. Norton
8. Strategy Focused organization: Robert S. Kaplan, David P. Norton

Intelligent System (3 – 0 – 2)

Evaluation:

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

Course Objectives:

This course provides basic knowledge of intelligent system. Moreover, this course enables students to design and build small-scale real world intelligent systems for a variety of application domains.

Course Contents:

1. Introduction to AI **4 hrs**

1.1 Introduction and Importance of AI
1.2 AI and related fields.
1.3 Brief history of AI
1.4 Applications of Artificial Intelligence
1.5 Definition and importance of Knowledge
1.6 Learning.

2. Agent, Search and Game Playing **6 hrs**

2.1 Black –Box Model of Agent,
2.2 Intentionality and Goals
2.3 Games, Search, Heuristics, Pruning,
2.4 Strategies Rules
2.5 Making Simple Game –Playing Agents For TTT
2.6 Evaluation Functions, Utilitarian, Decision Making, Planning ,Internal Representation

3. Pattern Recognition **5 hrs**

3.1 Classification Problems
3.2 Evaluating Classifiers
3.3 Nearest Neighbor Methods
3.4 Training ,Testing and Validation
3.5 Over fitting and Complexity

4. Neural Network **5 hrs**

4.1 Biological neural Networks
4.2 Perceptrons, Multilayer and Recursive nets
4.3 Gradient Descent
4.4 Back Propagation

5. Probabilistic Methods **5 hrs**

5.1 Introduction to Probabilistic Reasoning,

5.2 Bayes and Markov Networks,DBN's and HMM's

6. Genetic Algorithm **5 hrs**

6.1 Introduction
6.2 Genetic Algorithm
6.3 Procedure of genetic algorithm
6.4 The Working of Genetic algorithm
6.5 The logic behind genetic algorithm
6.6 Evolutionary Programming

7. Expert System **7 hrs**

7.1 Introduction
7.2 Expert system, Feature, Characteristics, Development, Architecture
7.3 Goals and Basic activities and advantage
7.4 Stages in the Development of an Expert system
7.5 Probability –based Expert System
7.6 Expert system tools

8. Swarm Intelligence **8 hrs**

8.1 Introduction
8.2 Background of Ant Intelligent System
8.3 Importance of the Ant colony paradigm
8.4 Ant Colony System
8.5 Development of the Ant Colony System
8.6 Application of Ant colony intelligence
8.7 The working of Ant colony Systems
8.8 Particle Swarm Intelligent System

Laboratory Work:

Laboratory exercises should be conducted in either LISP or PROLOG or Matlab (with computer vision and pattern recognition toolbox)

1 Coding Game Playing Agents ½
2 Basic Pattern Recognition in Matlab
3 Creating and Training HMMS
4 Simple GA's in Matlab and dedicated packages
5 Basic of neural network

Text Books:

1. Padhy N.P. Artificial Intelligence and Intelligent System
2. Stuart Russel and Peter Norvig, *Artificial Intelligence A Modern Approach*, Pearson

References:

1. D. W. Patterson, *Artificial Intelligence and Expert Systems*, Prentice Hall, 2001.
2. Richard Duda,Peter Hat,and Davi Stork ,Pattern Classification(2nd ED),Wiley,2000
3. Daniel Jurafsky and James Martin,Speech and Language processing(2nd Ed.)Prentice Hall 2008

4. Ivan Bratko, *PROLOG Programming for Artificial Intelligence*, Addison Wesley, 2001.
5. Leon Sterling, Ehud Shapiro, *The Art of PROLOG: Advanced Programming Techniques*, Prentice Hall, 1996.

Object Oriented Design and Modeling through UML (3-1-3)

Evaluation:

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

Course Objectives:

- To explain and illustrate the fundamental concepts of object orientation
- To introduce basic concepts of object-oriented analysis and design.
- To study the main features of the software development process in an object-oriented framework.
- To provide exposure to Visual Object Oriented Modeling languages, specifically UML (Unified Modelling Language).
- To develop skills on verifying, and validating a given specification presented in UML
- To develop a specification and implementation using UML from a given system requirements description.

Course Contents:

1. Object Oriented Fundamentals **10 hrs**

1.1. Introduction
1.2. Object Oriented Analysis and Design
1.3. Defining Models
1.4. Case Study
1.5. Requirement Process
1.6. Use Cases
1.7. Object Oriented Development Cycle
1.8. Overview of the Unified Modeling Language: UML Fundamentals and Notations

2. Object Oriented Analysis **12 hrs**

2.1. Building Conceptual Model
2.2. Adding Associations and Attributes
2.3. Representation of System Behavior

3. Object Oriented Design **14 hrs**

3.1. Analysis to Design
3.2. Describing and Elaborating Use Cases
3.3. Collaboration Diagram
3.4. Objects and Patterns
3.5. Determining Visibility
3.6. Class Diagram

4. Implementation **9 hrs**

4.1. Programming and Development Process
4.2. Mapping Design to Code
4.3. Creating Class Definitions from Design Class Diagrams

4.4. Creating Methods from Collaboration Diagram
4.5. Updating Class Definitions
4.6. Classes in Code
4.7. Exception and Error Handling

Laboratory Exercises:
Laboratory Exercise will include implementing all the UML diagrams and handling a object oriented design and modeling activity in a ACSE Environment. UML pattern design and modeling will be taken up with the help of *Rational Studio 2000* or any other CASE tools.

Text Book:

Larman, C., *Applying UML and Patterns*, Pearson Education Asia, ISBN: 81-7808-336-1

References:

1. Stevens, P., Pooley, R., *Using UML: Software Engineering with Objects and Components*, Addision-Wesley, 1999, ISBN: 981-2359-15-X
2. Fowler, M., Scott, K., *UML Distilled: Applying the Standard Object Modeling Language*, Addison-Wesley, 1997, ISBN: 981-4053-59-7
3. Booch, G., Jacobson, I., Rumbaugh, J., *The Unified Software Development Process*, Addison-Wesely, 1998, ISBN: 981-235-873-0
4. Booch, G., Jacobson, I., Rumbaugh, J., *The Unified Modeling Language User Guide*, Addison-Wesely, 1998, ISBN: 981-4053-31-7
5. Jacobson I., *Object-Oriented Software Engineering – A Use Case Driven Approach*, , Addison-Wesely, 1998, ISBN: 981235994X
6. Richter C., *Designing Flexible Object-Oriented Systems with UML*, Techmedia, 2000, ISBN: 81-7635-398-1
7. Booch, G., *Object-Oriented Analysis & Design*, Pearson Education Asia, 2000, ISBN: 81-7808-156-3

Project II (0 – 0 - 4)
(BE Computer / Software / IT)

Evaluation:

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

Objectives:

1. To provide the practical knowledge of project undertaking by focusing on planning, requirements elicitation, design, development and implementation of a project.
2. To provide the knowledge of Programming tools currently used in the market by carrying out a project.
3. To teach students to work and solve problem in a team environment
4. To provide the knowledge to formulate project documentation and oral presentation for his/her project.

Procedures:
The project course requires students to get themselves involved in a group consisting of generally 3-4 members and work jointly in a team, on a proposed task under the direct supervision of the faculty members of their respective department. The project may be selected in consultation with the industries and they shall be software and or electronic hardware based. The project may be done using any programming language or any platform and it may be any type of application e.g. Scientific Applications, Information Systems, Web Applications, Games, Simulations etc but it must find its practical usage in daily life and it should be relevant, as possible, to the local industry environment and its demands.

The project must be started at the beginning of the semester, span throughout the semester and finished by the end of that very semester. The project should be undertaken preferably by group of 3-4 students who will jointly work and implement the project. Term work will be jointly assessed by a panel of examiners as appointed by head of the institution. Oral examination will be conducted by internal and external examiners as appointed by the college.

Project Work Phases:
The entire project work shall be divided in to three phases and evaluation shall be done accordingly:

First Phase:
The students are required to form a team comprised of 3-4 team members and come up with a conceptual framework for their project work which must be documented in the form of a Proposal and presented in front of an examiner in a formal presentation lasting for about 10 minutes, on the date prescribed by the college or concerned department.
30% of the marks shall be based on the following criteria:

Evaluation Criteria:
Task Accomplished (20%)

- Feasibility Study
- Requirements Analysis and Specification

- Project plan
- Creativity, Innovativeness and Usefulness of the Idea

Documentation (10%)
- Proposal Report
- Estimations
- Time Line

Second Phase:
The students are required to show the progress of their work and the work done so far must be justifiable. They must have finished the design phase including the overall system/architectural design and validation scheme. 50% of total mark shall be based on the following criteria:

Evaluation Criteria:
Task Accomplished (40%)
- System/Architectural Design
- Depth of Project work
- Progress
- Level of achievement
- Group/Team Effort
- Ability to propose solutions

Documentation (10%)
- Report organization
- Completeness and consistency of the report
- Validation Criteria
- Organization and analysis of data and results

Third Phase (20%):
All students must have finished all phases of their project work including requirements analysis, design, coding, testing on time by the time they come for the Final Project Presentation.
Students must come up with a visible output of the product that they have developed and perform an oral defense of their work in the presence of an external examiner (external to the department or from industries). The final presentation should be conducted on the last week of final semester term as far as practicable.

Evaluation (20%):
- Presentation
- Completeness, Consistency and Final Output of the Project
- Viva
- Final Project Report

Business Process and IT strategy (2 – 0 – 0)

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. Understand how emerging trends in information technology and innovation affect business processes and potentially create value (Emerging Technologies).
2. Utilize the fundamentals of business process innovation and how to manage business process innovation initiatives and process configurations to impact business agility

Course Contents:

1. Introduction of Business process and Information System (5 hrs)

1.1. Organization process
1.2. Flows in business process
1.3. Monitor process performance
1.4. Application Infrastructure
1.5. Information system and business process
1.6. Importance of information system (data and information, Functional information system)
1.7. Functional organizational structure (Delay in execution the process, excess inventory, lack of visibility across processes)

2. Enterprise System (7 hrs)

2.1. Role of enterprise system in organization
2.2. Execute the process
2.3. Capture and store process data
2.4. Stand-alone mainframe systems
2.5. Client server architecture
2.6. Service Oriented Architecture
2.7. Types of Enterprise system
2.8. Types of Data in enterprise system (transaction data, master data, organizational data)
2.9. SAP Overview
2.10. SAP software

3. IT and Strategy (5 hrs)

3.1. Information revolution
3.2. Business and Strategy
3.3. Information Technology Strategy
3.4. Strategies and success
3.5. Design parameters and Strategic positioning
3.6. Evolution and development of strategy
3.7. Strategic planning and IT strategies

3.8. Evolving a dynamic nature of the Business

4. Managing IT **(5 hrs)**

4.1. IT management and Its Role
4.2. IT governance and infrastructure
4.3. IT Governance and Strategy
4.4. Technology Management Process
4.5. Steps in Technology Management
4.6. Strategic Aspects of IT and Positioning the company for change
4.7. IT and business alignment
4.8. Risk management
4.9. Implementing and Exploiting IT capabilities
4.10. Using IT in a Strategic Manner
4.11. Measuring IT with Performance measures and Balanced Score card
4.12. Implementing change in IT management

5. E - Strategy **(5 hrs)**

5.1. Introduction
5.2. E business and E-strategy
5.3. Developing an E-strategy
5.4. E-business objectives
5.5. E-commerce and E-business
5.6. Business –model and E-business model
5.7. Making E-strategy and E-economy
5.8. Best practice and Competitive advantage

6. IT Strategy for Knowledge Management **(5 hrs)**

6.1. Knowledge Management and IT strategies
6.2. IT strategies and Knowledge management road map
6.3. Role of Knowledge management in It strategies
6.4. Knowledge industry and knowledge strategy-knowledge Workers
6.5. IT strategic Services, Product and Consulting

7. IT strategy for IT companies **(5 hrs)**

7.1. Strategic aspects for an IT product companies and IT strategic development
7.2. IT strategy and innovation driving factor of start-up product companies
7.3. IT strategies for product life cycle and dealing with chasm
7.4. Project life cycle ad Strategies at various stages
7.5. Technology Selection and IT strategic aspects
7.6. Technology change management

8. IT Strategy Implementation **(4 hrs)**

8.1. Introduction and Development of IT strategic plan
8.2. System and Technology strategies: Implementation Aspects
8.3. IT strategy Implementation and leadership
8.4. Implementation of an IT innovation Strategy

8.5. IT strategy and Specialization
8.6. Implementing IT strategies for execution
8.7. IT strategy Audit

9. **Global IT strategies** **(4 hrs)**
9.1. IT strategy in global environment
9.2. Global Product life cycle
9.3. The Technology Environment and Global IT strategy
9.4. IT strategic Issues
9.5. Project management
9.6. innovation and knowledge management
9.7. Convergence Model for IT and IS in a Global Organization

Project Work:

- Develop a business Strategy for a small IT company which focuses on building a software product and services and develop a IT strategy for a company
- Develop a risk management Plan
- Preparation of e- business model for an ISP company
- Develop a E strategy for a company for E commerce site
- Case study for knowledge management

Text books :

1. Kulkarni Parag,Chande k.pradip, IT strategy for Business ,Oxford-2008
2. Word Jeffrey, Magal R.Simha, Essential of Business Processes and Information System

ICT Project Management (3-1-0)

Evaluation:

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

Objectives:

The general objectives of the course are as follows:

- To acquaint the students with the fundamentals of Project Management in ICT sector.
- To apprise the students with the different knowledge required for managing ICT Projects.
- To make the students aware about the different project group processes and specific knowledge areas of ICT Project Management from entrepreneurial perspective.

Course Contents:

Unit **Content** **Hours**

1. Introduction **3 hrs**

1.1. Project, Program, Portfolio and System
1.2. Project Objectives and Goals
  - SMART Goals
1.3. Classification of Projects
1.4. Project Constraints
1.5. Project Management and Its Advantages
1.6. Project Management Body of Knowledge
1.7. Project Environment
  - Internal, Task and External Environment
1.8. Skill Requirements of Project Manager
1.9. Roles and Responsibilities of Project Manager
1.10. Project Management Institute's Framework and International Certification

2. Project Organization and Project Life Cycle **2 hrs**

2.1. Organizational Structure
2.2. Matrix Organization and Its Types
2.3. Organizational Structure Influences on Project
2.4. Project Team
2.5. Project Life Cycle and Phases

3. Project Management Process Groups **2 hrs**

3.1. Project Management Processes
3.2. Roles of Major Knowledge Areas on Processes
3.3. Understanding Organizational Process Assets

3.4. Understanding Enterprise Environment Factor

4. Project Integration Management **6 hrs**

4.1. Project Integration Management Process
4.2. Developing Project Charter
4.3. Developing Project Management Plan
4.4. Direct and Manage Project Execution
4.5. Monitoring and Controlling Project Work
4.6. Perform Integrated Change Control
4.7. Closing Project or Phase

5. Project Scope Management **3 hrs**

5.1. Project and Product Scope
5.2. Project Scope Management Process
5.3. Planning Project Scope Management
5.4. Collect Requirements
5.5. Define Scope
5.6. Creating Work Breakdown Structure
5.7. Scope Validation
5.8. Scope Control

6. Project Time Management **6 hrs**

6.1. Project Time Management Process
6.2. Planning Project Time Management
6.3. Defining Event, Activity and Activity Attributes
6.4. Activity Sequencing
6.5. Network Analysis and Network Diagram
6.6. Activity Resource and Activity Duration Estimating
6.7. Schedule Development
6.8. Milestones and Gantt Charts
6.9. Forward and Backward Pass
6.10. CPM
6.11. PERT
6.12. Schedule Control

7. Project Cost Management **5 hrs**

7.1. Fundamentals of Project Cost
7.2. Project Cost Estimation Process
7.3. Review of Cost Estimation and Its Types
7.4. Planning Cost Management
7.5. Estimating Cost
7.6. Determining Budget
7.7. Cost Control and Its Measures

7.8. Earned Value Analysis
- Cost Variance
- Schedule Variance
- Cost Performance Index
- Schedule Performance Index
- Earned Value Management

8. Project Quality Management 2 hrs

8.1. Project Quality Management Process
8.2. Planning Project Quality Management
8.3. Review of Quality Assurance and Quality Control

9. Project Human Resource Management 4 hrs

9.1. Project Human Resource Management Process
9.2. Planning Project Human Resource Management
9.3. Acquire Project Team
9.4. Develop Project Team
9.5. Manage Project Team

10. Project Communication Management 3 hrs

10.1. Basics of Communication
10.2. Project Communication Management Processes
10.3. Importance of Communication Management
10.4. Planning Project Communication Management
10.5. Manage Communication
10.6. Control Communication

11. Project Risk Management 3 hrs

11.1. Reviewing Risks and Its Types
11.2. Risk Management Process
11.3. Planning Risk Management
11.4. Reviewing Risk Identification
11.5. Reviewing Risk Analysis
11.6. Quantitative and Qualitative Risk Assessment Processes
11.7. Risk Response Planning
11.8. Controlling Risk

12. Project Procurement Management 3 hrs

12.1. Project Procurement Management Process
12.2. Plan Project Procurement Management
12.3. Conduct Procurement
12.4. Control Procurement
12.5. Close Procurement
12.6. Public Procurement Act in Nepal

13. Project Stakeholders Management 3 hrs

13.1. Project Stakeholders Management Process
13.2. Identify Stakeholder
13.3. Plan Stakeholder Management

13.4. Manage Stakeholder Engagement
13.5. Control Stakeholder Management

Text Book:

"A Guide to the Project Management Body of knowledge", Fifth Edition, Project
Management Institute Inc., USA, 2013.

References:

- Maylor, H. "Project Management", Pearson India, 2003.
- Agrawal, G. R., "Project Management in Nepal", M.K. Publishers, Nepal, 2005.
- Kerzner, H., "Project Management: A Systems Approach to Planning, Scheduling and Controlling", CBS Publishers, New Delhi, 1987.
- Orr, A.D., "Advanced Project Management", First Edition, Kogan Page, 2008.
- Shenhar, A.J., Dvir, D., "Reinventing Project Management", Fifth Edition, Harvard Business School Press, 2007.

Multimedia Systems (3 – 0 - 3)

Evaluation:

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

Course Objectives:

To introduce the technologies, concepts and techniques associated with the development of multimedia systems.

Course Contents:

1. **Multimedia** **4 hrs**
   - 1.1 Introduction: Overview of multimedia, Multimedia building blocks, Digital representation, Interaction techniques and devices.
   - 1.2 The Medium aspect
   - 1.3 Main Properties of Multimedia System
   - 1.4 Definition of Multimedia Systems
   - 1.5 Media Combination and Independence
   - 1.6 Traditional Data Stream Characteristics
   - 1.7 Information Units.

2. **Sound and Audio** **4 hrs**
   - 2.1 Basic Sound Concepts: Representation and Formats
   - 2.2 Basic Music (MIDI) Concepts: Devices, Messages, Standards and Software
   - 2.3 Speech: Generation, Analysis and Transmission.

3. **Images and Graphics** **4 hrs**
   - 3.1 Basic Image Concepts: Representation and Format
   - 3.2 Image Processing Fundamentals: Synthesis, Analysis and Transmission.
   - 3.3 Image Enhancement: Enhancement by point processing, Spatial filtering, Color image processing

4. **Video and Animation** **5 hrs**
   - 4.1 Basic Video Concepts: Representation and Format
   - 4.2 Television
   - 4.3 Basic Concepts of Animation
   - 4.4 Types of animation
   - 4.5 Principles of animation
   - 4.6 Techniques of animation
   - 4.7 Creating animation
   - 4.8 Animation Language, Control and Transmission.

5. Data Compression **8 hrs**

5.1 Data Compression and Coding Fundamentals
- 5.1.1. Storage Space
- 5.1.2. Coding Requirements
- 5.1.3. Source, Entropy and Hybrid Coding

5.2 Basic Data Compression Techniques

5.3 Data Compression and Coding Standards:
- 5.3.1. JPEG
- 5.3.2. H.261 (px64)
- 5.3.3. MPEG
- 5.3.4. DVI.

6. Optical Storage Media **5 hrs**

6.1 Basic Technology
6.2 Video Disk Fundamentals
6.3 CD Audio
6.4 CD-ROM and Extended Architecture
6.5 Principles of CD-Write Once and CD-Magneto Optical
6.6 Other Storage Media: DVD, Flash Drive, HD Cards, USB

7. Computer Technology and Multimedia Operating Systems (MOS) **5 hrs**

7.1 Communication Architecture: Hybrid and Digital Systems
7.2 Multimedia Workstation
7.3 Introduction to MOS
7.4 Function of MOS
7.5 Multimedia Real Time System

8. Documentation, Hypertext and MHEG **5 hrs**

8.1 Document Architecture and Multimedia Integration
8.2 Hypertext, Hypermedia and Multimedia
8.3 Hypermedia System: Architecture, Nodes and Pointers
8.4 Document Architecture: SGML and ODA
8.5 MHEG.

9. Multimedia Communication Systems **5 hrs**

9.1 Definition of Multimedia Communication
9.2 Application Subsystem
9.3 Transport Subsystem: Requirements, Transport Layer, Network Layer
9.4 Quality of Service and Resource Management

Laboratory Exercises:

Laboratory Exercise includes integration of multimedia (Audio: Speech and Music, Video: Static and Movie, Animation Programming, etc), with application programs through high-level language programming, such as C++ or Java.

Text Book:

Steinmetz, R., Nahrstedt, K., *Multimedia: Computing, Communications and Applications*, Pearson Education Asia, 2001, ISBN: 81-7808-319-1

References:

1 Andleigh, P., Thakrar, *Multimedia Systems Design*, Prentice Hall, NJ, 1996

2 Gibbs S.J., Tsichritzis, D.C., *Multimedia Programming: Objects, Environments and Frameworks*, Addison-Wesley, 1995

3 Koegel-Buford, J.F., Multimedia Systems, Addison-Wesley, 1994

4 K.R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson, 2002

5 Ranjan Parekh, Principle of Multimedia, Tata McGraw-Hill Education, 2006

Network Programming (3 – 0 – 2)

Evaluation:

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

Objectives:
Computer network programming involves writing computer programs that enable process to communicate with each other across a computer network or within same system. **Network programming is client-Server programming** so to make

Two processes to communicate with each other one process must take the initiative while the other is waiting for it. Therefore, network programming ineluctably assumes a client-server model. The process initiating the communication is a client, and the process waiting for the communication to be initiated is a server.

The core objectives of the course is to design and implement the client-server based system, which must able to communicate across the different network platform without depending on operating system architecture.

At the end of the course, the students would able to design and implement computer network based client server application which can talk across the network or within the same system.

Course Contents:

1. **Network Programming Fundamentals** **(6 hrs)**
   - Introduction to Networking and network programming
   - Client/Server mode
   - Communication Protocol (TCP, IP, UDP, SCTP)
   - TCP state transition Diagram
   - Protocol comparison

2. **UNIX Programming** **(22 hrs)**
   - Sockets Introduction
   - Socket Address Structures
   - Values Result arguments
   - Byte ordering and Manipulation functions
   - Fork and exec functions
   - Concurrent Servers
   - UNIX /INTERNET domain socket
   - Socket System Calls
   - Passing file descriptor
   - I/O models (blocking, non-blocking, multiplexing, signal driven, asynchronous)
   - Socket option, getsockopt, setsockopt, fcntl

- Daemon Process, Syslogd Daemon, syslog function, ioctl operation, ioctl function
- Socket operations
- UNIX and Internet domain socket implementation.

3. Winsock Programming (15 hrs)

- Introduction to Winsock architecture
- Winsock DLL
- Windows sockets and Blocking I/O
- Windows Socket Extension; Setup and Cleanup Function
- Function for Handling Blocked I/O
- Asynchronous Database function
- Asynchronous I/O functions
- Error Handling Functions; Asynchronous Operation
- Using Non-Blocking socket, Non-Blocking with connect
- Select in conjunction with accept, select with recv/recvfrom and send/sendto
- Sending and Receiving Data over connection.

4. Network Utilities and Application (2 hrs)

- Telnet
- Netsat
- ifconfig/ipconfig
- ping
- TFTP
- Remote Login

Laboratory Exercises:

1. Implementing ECHO server using C and LINUX.
2. Implementing Date and Time Routines in C and LINUX.
3. Implementing Concurrent Server using FORK and EXEC call in LINUX.
4. UNIX and Internet Domain SOCKET in LINUX using C.
5. Implementing Winsock using C.
6. Implementing Message Exchanger between LINUX and Windows.

Reference Books:

1. Steven, R., UNIX network Programming VOL-1
2. Alok k.Sinha.,Network Programming in WINDOWS NT,Addison Wesley,1996
3. Douglas E.Comers,David L.Stevens Internetworking with TCP/IP Volume III,Second Edition

Engineering Economics (3-2-0)

Evaluation:

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

Course Objective:

After completing this course, students will be able to

- understand and describe the basic concept of economics, engineering economics, cost accounting and time value of money,
- assist in the valuation of engineering projects in the public and private sector to take investment decisions,
- analyze the project risk and understand the concept of ecological limit and economic development,
- calculate depreciation, taxation and its application in analysis and
- identify different financing options and general accounting procedures.

Course Contents:

1. Basics of Engineering Economics (3 hrs)

1.1. Definition of Economics, Demand, the Law of Demand, Law of Diminishing Utility, Marginal Utility, Supply, Law of Supply, Law of Supply and Demand

1.2. Engineering Economics, Principles of Engineering Economy and its application

2. Cost Concept and Fundamentals of Cost Accounting (3 hrs)

2.1. Cost Terminology: Manufacturing Cost and Non-Manufacturing Cost

2.2. Cost for Business Decision: Differential Cost and Revenue; Opportunity Cost,Sunk Cost and Marginal Cost

3. Time Value of Money (4 hrs)

3.1. Interest, Simple Interest, Compound Interest, Nominal Rate of Interest, Effective Rate of Interest

3.2. Economic Equivalence: Present Worth, Future Worth and Annual Worth

3.3. Development of Formulas for Equivalence Calculation

4. Basic Methods of Engineering Economic Studies (7 hrs)

4.1. Minimum Attractive Rate of Return - MARR

4.2. Payback Period Method – Simple and Discounted

4.3. Equivalent Worth Methods; Present Worth Method, Future Worth Method and Annual Worth Method

4.4. Rate of Return Methods: Internal Rate of Return (IRR) MethodandExternal/Modified Rate of Return(ERR/MIRR) Method

4.5. Benefit Cost Ratio Method

5. Comparative Analysis of Alternatives (6 hrs)

5.1. Comparing Mutually Exclusive Alternatives having Same useful life by Payback Period Method, Equivalent Worth Method; Rate of Return Methods and Benefit Cost Ratio Method

5.2. Comparing Mutually Exclusive Alternatives having different useful lives byRepeatability Assumption, Co-terminated Assumption, Capitalized Worth Method

5.3. Comparing Mutually Exclusive, Contingent and Independent Projects in Combination.

6. Risk Analysis (4 hrs)

6.1. Origin/Sources of Project Risks.

6.2. Methods of Describing Project Risks; Sensitivity Analysis, Breakeven Analysis, Scenario Analysis

7. Ecological Limits and Economic Development (3 hrs)

7.1. Economic Theory and Ecological Limit,

7.2. Concept of sustainable development,

7.3. Ecological Footprint and

7.4. Overcoming Ecological Limits

8. Depreciation and Corporate Income Taxes (5 hrs)

8.1. Depreciation and its causes, Asset Depreciation and Accounting Depreciation

8.2. Basic Methods of Depreciation; Straight line method, Declining Balance Method, Sinking Fund Method, Sum of the Year Digit Method, Unit of Production Method, Modified Accelerated Cost Recovery System (MACRS)

8.3. Introduction to Corporate Income Tax. Taxation Law, Depreciation Rates Personal Tax, Corporate Tax, VAT

8.4. After Tax Cash flow Estimate, General Procedure for Making After Tax Economic Analysis

9. Enterprise Financing and Capital Investment (4 hrs)

9.1. Method of Financing: Equity Financing, Debt Financing and Capital Structure

9.2. Cost of Capital: Cost of Equity, Cost of Debt and calculating cost of capital

9.3. Project Funding Mechanism: Government budget, Public Private Partnership and Private Investment

9.4. FIRR, EIRR and Return on Equity

10. Basic Accounting Procedure (6 hrs)

10.1. Accounting Terminologies; Asset and liabilities: Fundamental equation of accounting

10.2. Financial statements: The Balance Sheet, Income Statement and Cashflow Statements

10.3. Using Ratios to make Decisions: Debt Ratio, Current Ratio, Quick Ratio – Acid Test Ratio, Inventory Turnover Ratio, Total Asset Turnover, Profit Margin on Sales, Return on Total Assets, Price Earnings Ratio and Book Value per Share

Tutorials:

Two assignments and 1 case study.

Text Book:

1. Chan S. Park. *Contemporary Engineering Economics.*PHI Learning Private Limited.

References:

1. E. Paul De Garmo, William G. Sullivan and James A. Bontadelli. *Engineering Economy*. MC Milan Publishing Company.
2. James L. Riggs, David D.Bedworth and Sabah U. Randhawa.*Engineering Economics.* Tata MCGraw Hill Education Private Limited.
3. N.N. Borish and S. Kaplan.*Economic Analysis for Engineering and Managerial Decision Making.* MC Gran Hill Publishing Company.
4. Adhikari, D.*Principle's of Engineering Economic Analysis.*Nepal: Global Publication.
5. SenGupta, Ramprasad.*Ecological Limits and Economic Development.*Oxford University Press**.**

Mobile and Wireless Communication (3 – 1 – 0)

Evaluation:

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

Course Objectives:

- To provide overall knowledge of wireless communication systems and technologies,
- To be able to design basic wireless communication systems

Course Contents:

1. Introduction (4 hrs)

1.1 Definition, advantages and disadvantages of Wireless Communication System
1.3 Evolution of Mobile Radio Communications (1G to 4G and beyond)
1.4 Wireless Systems and comparisons (CDMA, GSM & DECT)

2. Principles of Cellular Concept (6 hrs)

2.1 Introduction to Cellular Terminology
2.2 Cell structure and Cluster
2.3 Frequency Re-use , Planning, Spectrum Utilization and Channel Assignment Strategies
2.5 Handoff Strategies, types and practical considerations
2.6 Interference and System Capacity
2.7 Trunking and Grade of Service (GOS)
2.8 Improving Capacity and Coverage in Cellular System

3. Mobile Radio Propagation (8 hrs)

3.1 Introduction to Radio Wave Propagation
3.2 Large scale path loss
  3.2.1 Concept of Free Space Propagation Model
  3.2.2 The Three Basic Propagation Mechanism (Concept of Reflection, Diffraction & Scattering)
  3.2.3 Link Budget Design
  3.2.4 Indoor Propagation Models (partition loss, log-distance model, multi breakpoint model & attenuation factor model)
  3.2.5 Outdoor Propagation Models (Okumura, Hata Model & Longley-Rice)
3.3 Small Scale fading and multipath
  3.3.1 Parameters of Mobile Multipath Channel (time dispersive, Coherent bandwidth, Doppler spread and Coherent time)
  3.3.2 Types of Small Scale Fading (flat, frequency selective, fast and slow)
  3.3.3 Rayleigh and Ricean fading distribution

4. Modulation Technique, Channel and Speech Coding (10 hrs)

4.1 Review of Modulation Technique (Analog and Digital Modulation)

4.1.1 Linear Modulation Technique (BPSK, DPSK, QPSK's)
4.1.2 Non linear Modulation Techniques (BFSK, MSK, GMSK)
4.2 Spread Spectrum Modulation Technique (direct sequence and frequency hopped)
4.3 Orthogonal Frequency Division Multiplexing (OFDM)
4.4 Concept of Channel coding
4.4.1 Review of Block, Cyclic, Convolutional, Hamming, Hadamard
4.5 Characteristics of speech signal and its significance
4.6 Significance of Vocoders and its types (Channel, Formant, Linear predictive coders)
4.7 The GSM Codec

5. Equalization and Diversity (4 hrs)

5.1 Introduction and Fundamental of Equalization
5.2 Linear and Non linear equalizers
5.2 Introduction to Diversity and its Technique
5.3 RAKE Receiver
5.4 Interleaving

6. Multiple Access in Wireless Communications (4 hrs)

6.1 Review of Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), principle and applications
6.2 Spread Spectrum Multiple Access (SSMA) principle and applications
6.2.1 Frequency Hopped Multiple Access (FHMA)
6.2.2 Direct Sequence Multiple Access (eg. CDMA)
6.3 Space Division Multiple Access (SDMA)
6.4 Hybrid Spread Spectrum Multiple Access Techniques

7. Wireless System and Standards (9 hrs)

7.1 Global System for Mobile (GSM): Service and Feature, System and Architecture, Example of GSM Call
7.2 Code Division Multiple Access (CDMA): Frequency and Channel Specifications, Forward CDMA Channel, Reverse CDMA Channel
7.3 Recent development (Compare Global trends with that of Nepal)
7.4 Basic Overview of DECT, WLAN, WiFi, WiMAX, LTE
7.5 Overview of Mobile Operating System(e.g. Android, iOS)

Practical:

Case Study (Mobile service operation, Network service operation, Internet Service Operation)

Text Books:

1. *Wireless Communications Principles and Practice*, Theodore S Rappaport
2. *Modern Wireless Communications*, Simon Haykin & Michael Moher, Pearson Education, 2007.

Reference Books:

1. *Wireless Communications*, Andreas. F. Molisch, John Wiley.
2. *Mobile Communication*, J. Schiller.

3. *Wireless Communications and Networks*, William Stallings, Pearson Education Asia.
4. *Modern Digital and Analog Communication System*, B. P. Lathi.
5. *Digital Communication system*, J. Proakis.
6. *Mobile Phone Operating Systems*, By Books Llc

Social & Professional Issues in IT (2 – 1 – 0)

Evaluation:

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

Course Objectives:
The objective of this course is to provide the knowledge to handle social, professional and legal issues that arise in the professional working environment.

Course Contents:

1. History of Computing **4 hrs**
- 1.1. Prehistory of Computing
- 1.2. History of Computer Hardware
- 1.3. History of Software: Programming Languages and Operating Systems
- 1.4. History of Networking
- 1.5. Pioneers of Computing

2. Social Context of Computing **5 hrs**
- 2.1. Society and Technology
  - 2.1.1. Impact of Technology on Society and Vice Versa
  - 2.1.2. Using Technology for Poverty Alleviation
  - 2.1.3. Health Related Issues for an IT Professional
- 2.2. Internet and Society
  - 2.2.1. Digital Divide and Bridging the Digital Divide
  - 2.2.2. Governance of Internet
- 2.3. E-Governance and E-Government Systems

3. Computer Ethics and Ethical Theories **3 hrs**
- 3.1. Philosophical and Professional Ethics
- 3.2. Moral and Legal Issues
- 3.3. Descriptive and Normative Claims
- 3.4. Ethical Relativism
- 3.5. Utilitarianism and Deontological Theories
- 3.6. Rights

4. Professional Ethics **3 hrs**
- 4.1. Profession
  - 4.1.1. Job and Occupation
  - 4.1.2. Characteristics of Profession
  - 4.1.3. Engineering and Computing as a Profession
- 4.2. Professional Responsibilities and Rights

- 4.2.1. Conflict of Interests and Whistleblowing
- 4.3. Professional Code of Ethics
  - 4.3.1. Code of Ethics of Nepal Engineering Council
  - 4.3.2. Code of Ethics of IEEE and ACM
- 4.4. Hacker Ethics and Netiquette

5. Risk and Responsibilities **3 hrs**

- 5.1. Computer Liability
  - 5.1.1. Malfunction of Computers
  - 5.1.2. Safety in Critical Systems
  - 5.1.3. Accuracy vs. Democracy in Internet
  - 5.1.4. Misinterpretation of Information and its Liability
- 5.2. Values in Design
  - 5.2.1. Software and Design Problems
  - 5.2.2. Hardware Design Issue
  - 5.2.3. Elimination of Hardware
- 5.3. Professional Responsibilities of Computer Users
  - 5.3.1. Responsibility and Accountability

6. Privacy **3 hrs**

- 6.1. Privacy and its Value
- 6.2. Privacy Risks
  - 6.2.1. Government Information
  - 6.2.2. Consumer Information
- 6.3. Privacy of Consumer Information
  - 6.3.1. Databases and Personal Records
  - 6.3.2. E-mail Privacy
  - 6.3.3. Web Privacy
- 6.4. Protecting Privacy
- 6.5. Offensive Speech and Censorship in Cyberspace
- 6.6. Anonymity

7. Computer and Cyber Crimes **4 hrs**

- 7.1. Introduction to Computer Crime and Cyber Crime
- 7.2. Types of Computer Crimes
  - 7.2.1. Traditional Computer Crimes and Software Piracy
  - 7.2.2. Computer Frauds and Digital Forgery
  - 7.2.3. Phishing
  - 7.2.4. Unauthorized Access: Hacking, cracking
  - 7.2.5. Denial of Service
  - 7.2.6. Computer Invasion of Privacy
  - 7.2.7. Harmful Content Crime
  - 7.2.8. Online Pornography
  - 7.2.9. Online Harassment
  - 7.2.10. Cyber Stalking and Online Scams
  - 7.2.11. Spams

7.2.12. Malicious Programs: Viruses, Worms, Trojan Horses
7.2.13. Cyber Terrorism
7.3. Introduction to Digital Forensics

8. Intellectual Property and Legal Issues 5 hrs

8.1. Intellectual Properties
8.1.1. Copyright
8.1.2. Patent
8.1.3. Design
8.1.4. Trademark
8.1.5. Trade-secrets
8.1.6. IPR in Nepal: "Copyright Act", and "Patent, Design and Trademark Act"
8.2. IT Related Laws in Nepal
8.2.1. IT Policy of Nepal
8.2.2. Right to Information Act
8.2.3. Electronics Transaction Act and Rules
8.2.4. Secure Password Practices Issued by GoN

Text Books:

1. Johnson, D. G., *Computer Ethics*, Pearson Education Asia, Third Edition, 2001, ISBN: 81-7808-306-X.
2. IT Policies, Laws and Acts of the Government of Nepal. Available at: www.lawcommission.gov.np and www.cca.gov.np

Reference Books:

1. Hussain, K. M., and Hussain, D. S., *Computers; Technology, Applications, and Social Implications*, PHI, New Delhi, ISBN: 81-203-0620-1.
2. Sara Baase, *A Gift of Fire: Social, Legal, and Ethical Issues for Computers and the Internet*, latest Edition, Prentice Hall
3. Articles collected from various Journals and Periodicals, such as IEEE-Computer, BYTE, ACM Periodicals, etc.
4. IT Policies and Laws of the local government
5. International IT Policies and Laws (Source: ISO, SEI, IEEE, etc.)