CURRICULUM

DIPLOMA

Computer Engineering

(Three-year program-semester system)

Council for Technical Education and Vocational Training
Curriculum Development and Equivalence Division
Sanothimi, Bhaktapur

2001
First Revision 2002
Second Revision 2010
Third Revision 2018
Fourth Revision 2022

Contents

Introduction

This three years Diploma in Computer Engineering curriculum is designed to produce middle level skilled technician updated with latest skills of computer and information technology with a view to cope with the emerging technological change. Many people in the developed, developing and under developed countries have been given emphasis for the broader application of computer. Computer Engineering has been contributing the world for the overall development and creating job or employment opportunities in both public and private sectors.

This curriculum is designed to foster knowledge and skills to the technician required by the computer engineering and information technology related industries and organizations in Nepal. The Diploma in Computer Engineering program extends over three years. Each year is divided into two semesters. There are six semesters in total within the period of three years.

The first-year courses include the basic science subjects like physics, chemistry, and mathematics applicable in the field of computer Engineering. It also includes language subjects like Nepali and English applicable for the communication in the field of computer engineering. The second-year courses focus on the basic disciplinary subjects of computer engineering. Similarly, third year courses comprise of the disciplinary subjects and the application of learned skills and knowledge by making the provision of major and minor projects as well as elective subjects in the specific areas of computer engineering.

The course structure and the subject-wise contents that follow reflect the details of this curriculum. In short, this curriculum guides its implementers to produce competent and highly employable middle level technical human resources in the field of computer engineering.

The contents of each subject prescribed in the curriculum are incorporated in the light of "must to know and must to do" principle. The contents of the curriculum are minutely describing in micro level.

Rationale of Revision

Diploma in Computer Engineering curriculum was developed in 2001. This is the fourth revision after the implementation of its development. The rationales behind its revision are as follows:

- The implementing agencies/college have requested to revise this curriculum based on their teaching experiences.
- All Diploma level Engineering Courses' first and second semester subjects are re-adjusted and are common.
- The semester-wise re-adjustments of the existing subjects are felt necessary.
- It is needed to revisit its weightage in both theory and practical marks contents to make it more practical oriented.
- The technologies invented in this field seems necessary to be incorporated.

Furthermore, technicians are projected to grow faster than the average for all occupations. Jobs for Diploma in Computer Engineering are projected to increase at a faster-than-average rate. To cope with the national and international demands, the knowledge and skills of this curricular program should be updated to make the skills relevant and pertinent to the related computer engineering sector.

Curriculum Title
Diploma in Computer Engineering.

Aim
The program aims to produce mid-level technical human resource equipped with knowledge and skills in allied field of study.

Objectives
The curriculum has following objectives:

1. To produce middle level competent technical workforce/human resources that could provide services to the public and private organizations in the field of Computer.
2. To prepare such technicians who are able to work in public and private organizations in general communication, banking and business sectors in particular.
3. To prepare such technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values.
4. To help in meeting the demand of such technical workforce required for the public and private organizations of Nepal.
5. To reduce the dependence on employing such technicians from foreign countries.
6. To create self-employment opportunities immensely.

Group Size
The group size is a maximum of 48.

Entry Qualification

- SLC pass or SEE or equivalent with minimum C Grade (2.0 Grade Point) in Mathematics and Science and 1.6 Grade Point or equivalent in English and as per the provisions mentioned in the admission guidelines of Office of the Controller of Examinations, CTEVT.
- Pre-diploma in related subject or equivalent with minimum 68.33%.
- Pass entrance examination administered by CTEVT.

Duration
The total duration of this curricular program is three academic years [six semesters]. The program is based on semester system. Moreover, one semester consists of 19.5 academic weeks including evaluation period. Actual teaching learning Hrs. will be not less than 15 weeks in each semester.

Medium of Instruction
The medium of instruction will be in English and/or Nepali.

Pattern of Attendance
Minimum of 90% attendance in each subject is required to appear in the respective final examination.

Teacher (Instructor) and Student Ratio
The ratio between teachers and students must be:

- Overall ratio of teacher and student must be 1:12 (at the institution level)
- 1:48 for theory and tutorial classes
- 1:12 for practical/demonstration

- 1:8 for bench work
- 75 % of the technical teachers must be full timer

Qualification of Instructional Staff

- The program coordinator should be a master's degree holder in the related subject area.
- The disciplinary subject related teachers should be a bachelor's degree holder in the related subject area.
- The demonstrators should be a bachelor's degree holder or diploma or equivalent with 3 years' work experience in the related subject area.
- The foundational subject related teacher (refer to course codes SH and MG) should be master's degree holder in the related subject area.

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- ***Printed media materials:*** Assignment sheets, case studies, handouts, performance checklists, textbooks etc.
- ***Non-project media materials:*** Displays, models, photographs, flipchart, poster, writing board etc.
- ***Projected media materials****:* Slides, Multimedia Projector.
- ***Audio-visual materials:*** Audiotapes, films, slide-tapes, videodisc, etc.
- ***Computer based instructional materials:*** Computer based training, interactive video etc.
- **Web-Based Instructional Materials** (Online learning)
- **Radio/Television/Telephone**
- **Education-focused social media platform**

Teaching Learning Methodologies

The methods of teaching will be a combination of several approaches, such as Illustrated talk, Lecture, Tutorial, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Report writing, Term paper presentation, Case analysis, Tutoring, Role-playing, Heuristic, Project work and Other Independent learning.

- Theory: Lecture, Discussion, Seminar, Interaction, Assignment, Group work.
- Practical: Demonstration, Observation, Guided practice, Self-practice, Project work.
- Internship: Industrial practice

Approach of Learning

There will be inductive, deductive and learner-centered approaches of learning.

Examinations and Marking Scheme

a. Internal assessment

- There will be a transparent/fair evaluation system for each subject in both theory and practical exposure.
- Each subject will have internal assessment at regular intervals and students will get the feedback about it.
- Weightage of theory and practical marks are mentioned in curriculum structure.

- Continuous assessment format will be developed and applied by the evaluators for evaluating student's performance in the subjects related to the practical experience.

b. Final examination

- Weightage of theory and practical marks are mentioned in structure.
- Students must pass in all subjects both in theory and practical for certification. If a student becomes unable to succeed in any subject, she/he will appear in the re-examination administered by CTEVT.
- Students will be allowed to appear in the final examination only after completing the internal assessment requirements.

c. Requirement for final practical examination

- Professional of relevant subject teacher must evaluate final practical examinations.
- One evaluator in one setting can evaluate not more than 20 students.
- Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned constituent or affiliated institute led by external evaluator nominated by CTEVT.
- Provision of re-examination will be as per CTEVT policy.

d. Final practicum evaluation will be based on:

- Institutional practicum attendance - 10%
- Logbook/Practicum book update - 10%
- Spot performance (assigned task/practicum performance/identification/arrangement preparation/measurement) - 40%
- Viva voce:
    - Internal examiner - 20%
    - External examiner - 20%

e. Pass marks:

- The students must secure minimum 40% marks in theory and 50% marks in practical. Moreover, the students must secure minimum pass marks in the internal assessment and in the yearly final examination of each subject to pass the subject.

Provision of Back Paper

There will be the provision of back paper but a student must pass all the subjects of all year within six years from the enrollment date; however, there should be provision of chance exam for final year students as per CTEVT rules.

Disciplinary and Ethical Requirements

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by the review of the disciplinary review committee of the institute.
- Dishonesty in academic or practical activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms in institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

Grading System

The grading system will be as follows:

Grading	Overall marks
• Distinction:	80% and above
• First division:	65% to below 80%
• Second division:	50% to below 65%
• Pass division:	Pass marks to Below 50%

Certificate Awarded

- Students who pass all the components of all subjects of all six semesters are considered to have successfully completed the course.
- Students who successfully complete the curricular program will be awarded with a degree of **"Diploma in Computer Engineering"**

Career Path

The graduates will be eligible for the position equivalent to non-gazette 1st class/Level 5 (technical) as prescribed by the Public Service Commission of Nepal and other related agencies.

General Attitudes Required

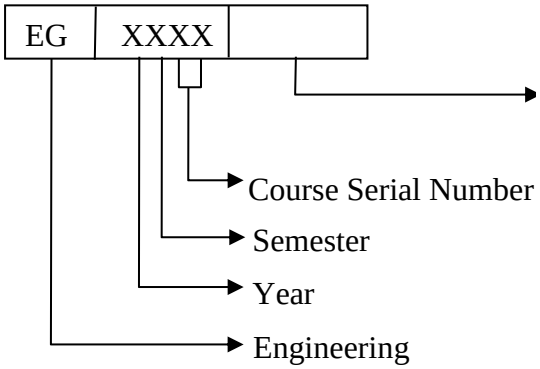
A student should demonstrate following general attitudes for effective and active learning. Acceptance, Affectionate, Ambitious, Aspiring, Candid, Caring, Change, Cheerful, Considerate, Cooperative, Courageous, Decisive, Determined, Devoted, Embraces, Endurance, Enthusiastic, Expansive, Faith, Flexible, Gloomy, Motivated, Perseverance, Thoughtful, Forgiving, Freedom, Friendly, Focused, Frugal, Generous, Goodwill, Grateful, Hardworking, Honest, Humble, Interested, Involved, Not jealous, Kind, Mature, Open minded, Tolerant, Optimistic, Positive, Practical, Punctual, Realistic, Reliable, Distant, Responsibility, Responsive, Responsible, Self-confident, Self-directed, Self-disciplined, Self-esteem, Self-giving, Self-reliant, Selfless, Sensitive, Serious, Sincere, Social independence, Sympathetic, Accepts others points of view, Thoughtful towards others, Trusting, Unpretentiousness, Unselfish, Willingness and Work-oriented.

Provision of Elective Subjects

There will be a provision of one for each elective I and elective II subjects in the third year/first part and third year/second part of this curriculum respectively. Subjects of Computer Engineering discipline such as Geographical Information System, E-commerce, Management Information System, E-governance, Computer Simulation and Modeling and Artificial Intelligence is offered as an elective. Forty percent students out of total number of enrolled students should be maintained in elective subject.

Subjects Codes

Each subject is coded with a unique number preceded and followed by certain letters as mentioned in following chart:



Offering Departments:

AE: Automobile Engineering

AGE: Agricultural Engineering

AR: Architecture Engineering

BM: Biomedical Engineering

BM: Biomedical Equipment Engineering

CE: Civil Engineering

CT: Computer Engineering

EE: Electrical Engineering

EEX: Electrical & Electronics Engineering

EX: Electronics Engineering

GE: Geomatics Engineering

HE: Hydropower Engineering

IT: Information Technology

ME: Mechanical Engineering

MG: Management

Curriculum Structure
Diploma in Computer Engineering

Year: I **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG1101SH	Applied Nepali	4				4	4	20	80	3				100	*Continuous assessment
2	EG1102SH	Applied English	4				4	4	20	80	3				100	
3	EG1103SH	Engineering Mathematics I	4	2			6	4	20	80	3				100	
4	EG1104SH	Engineering Physics I	4	2		2	8	5	20	60	3	10	10	2	100	
5	EG1105SH	Engineering Chemistry I	4	2		2	8	5	20	60	3	10	10	2	100	
6	EG1101AR	Engineering Drawing I	1		4		5	3	0	0		60	40	4	100	
7	EG1101CT	Computer Application	2		2		4	3	10	40	1.5	30	20	3	100	
		Total	**23**	**6**	**6**	**4**	**39**	**28**							**700**	

Year: I **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG1201SH	Engineering Mathematics II	4	2			6	4	20	80	3				100	*Continuous assessment
2	EG1202SH	Engineering Physics II	4	2		2	8	5	20	60	3	10	10	2	100	
3	EG1203SH	Engineering Chemistry II	4	2		2	8	5	20	60	3	10	10	2	100	
4	EG1201CE	Workshop Practice I	2		6		**8**	5	0	0		60	40	4	100	
5	EG1201AR	Engineering Drawing II	0		4		4	2	0	0		60	40	4	100	
6	EG1202CE	Applied Mechanics	3	2		2/2	6	4	20	60	3	20	0		100	
		Total	**17**	**8**	**10**	**5**	**40**	**25**							**600**	

Diploma in Computer Engineering

Year: II **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	DISTRIBUTION OF MARKS							
									Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG2101SH	Engineering Mathematics III	3	1			4	3	20	80	3				**100**	*continuous assessment
2	EG2101CT	C programming	4			3	7	6	20	80	3	30	20	3	**150**	
3	EG2102CT	Web Technology I	3	1		3	7	5	20	80	3	30	20	3	**150**	
4	EG2103CT	Digital Logic	3			2	5	4	20	80	3	30	20	3	**150**	
5	EG2104CT	Discrete Structure	3	1			4	3	20	80	3				**100**	
6	EG2105CT	Software Engineering	3			2	5	4	20	80	3	30	20	3	**150**	
7	EG2106CT	Basic Electrical and Electronics Engineering	3	1		3	7	5	20	80	3	30	20	3	**150**	
		Total	**22**	**4**		**13**	**39**	**30**							**950**	

Year: II **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	DISTRIBUTION OF MARKS							
									Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG2201CT	Database Management System	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG2202CT	Data Structure and Algorithm	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG2203CT	Object Oriented Programming in Java	4	1		3	8	6	20	80	3	30	20	3	**150**	
4	EG2204CT	Microprocessor and Computer Architecture	3	1		3	7	5	20	80	3	30	20	3	**150**	
5	EG2205CT	Web Technology II	3	1		3	7	5	20	80	3	30	20	3	**150**	
6	EG2206CT	Statistics and Probability	3	1			4	3	20	80	3				**100**	
		Total	**19**	**6**		**14**	**39**	**28**							**850**	

Diploma in Computer Engineering

Year: III **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG3101CT	Computer Graphics	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG3102CT	Data Communication and Network	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG3103CT	Operating System	3			2	5	4	20	80	3	30	20	3	**150**	
4	EG3104CT	Computer Repair and Maintenance	2			3	5	4	10	40	1.5	30	20	3	**100**	
5	EG3105CT	Data Mining and data warehousing	3			3	6	5	20	80	3	30	20	3	**150**	
6		Elective – I	3	1		3	7	5	20	80	3	30	20	3	**150**	
	EG3106CT.1	a) Geographical Information System														
	EG3106CT.2	b) E-commerce														
	EG3106CT.3	c) Management Information System														
7	EG3107CT	Minor Project			3		3	2				60	40	3	**100**	
		Total	**17**	**3**	**3**	**16**	**39**	**29**							**950**	

Year: III **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG3201CT	Multimedia System	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG3202CT	Internet of Things	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG3203CT	Information Security	3			2	5	4	20	80	3	30	20	3	**150**	
4	EG3201MG	Entrepreneurship Development	3		2		5	4	20	60	3	10	10	2	**100**	
5		Elective – II	3	1		3	7	5	20	80	3	30	20	3	**150**	
	EG3204CT.1	a) E-Governance														
	EG3204CT.2	b) Computer Simulation and Modeling														
	EG3204CT.3	c) Artificial Intelligence														
6	EG3205CT	Major Project			8		8	**4**				120	80		**200**	
		Total	**15**	**3**	**10**	**10**	**38**	**26**							**900**	

First Year (First and Second Semesters)

[See Separate Curriculum]

([Year I Part I and Year I Part II) Engineering All

Second Year/ First Part

S.N.	Course Code	Subject
1	EG2101SH	Engineering Mathematics III
2	EG2101CT	C programming
3	EG2102CT	Web Technology I
4	EG2103CT	Digital Logic
5	EG2104CT	Discrete Structure
6	EG2105CT	Software Engineering
7	EG2106CT	Basic Electrical and Electronics Engineering

Engineering Mathematics III

EG2101SH

Year: II **Total: 4 Hrs./week**

Part: I **Lecture: 3 Hrs./week**

Tutorial: 1 Hrs./week

Practical: Hrs./week

Lab: Hrs./week

Course Description:

This course consists of five units namely: Applications of derivatives, Partial derivatives, application of Anti-derivatives, Differential equations and Fourier series; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

Course Objectives:

On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas: Applications of derivatives and anti-derivatives, Partial derivatives, differential equations and Fourier series.

Course Contents:

Theory

Unit 1. Applications of Derivatives [12 Hrs.]

1.1. Derivatives of inverse circular functions and hyperbolic functions
1.2. Differentials, tangent and normal
1.3. Maxima and minima, concavity, increasing and decreasing functions
1.4. Rate measures
1.5. Indeterminate forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$ and $\infty - \infty$, L'Hospital's Rule (without proof)

Unit 2. Partial Derivatives [6 Hrs.]

2.1. Functions of more than two variables
2.2. Partial derivative from First principles
2.3. Partial derivatives of First and higher orders
2.4. Euler's theorem for function of two variables
2.5. Partial derivatives of composite functions

Unit 3. Applications of Anti-derivatives [8 Hrs.]

3.1. Standard Integrals, related numerical problems
3.2. Basic idea of curve sketching**:** odd and even functions, periodicity of a function, symmetry (about *x*-axis, *y*-axis and origin), monotonicity of a function, sketching graphs of polynomial, trigonometric, exponential, and logarithmic functions (simple cases only)
3.3. Area under a curve using limit of sum (without proof)
3.4. Area between two curves (without proof)
3.5. Area of closed a curve (circle and ellipse only)

Unit 4. Differential Equations [14 Hrs.]

4.1. Ordinary Differential Equations (ODEs)
  4.1.1. Definitions, order and degree of differential equation
  4.1.2. Differential equation of First order and First degree
  4.1.3. Variable separation and variable change methods

4.1.4. Homogeneous and linear differential equation of First order
4.1.5. Exact differential equation, condition of exactness
4.1.6. Simple applications of First order differential equations

4.2. Partial Differential Equations (PDEs)
4.2.1. Basic concepts, definition and formation
4.2.2. General solution of linear PDEs of first order (Pp + Qq = R form)

Unit 5. Fourier Series **[5 Hrs.]**

5.1. Periodic functions and fundamental period of periodic functions
5.2. Odd and even functions with their properties
5.3. Trigonometric series
5.4. Fourie's series in an interval of period 2π (arbitrary range is not required)

Tutorial: **[15 Hrs.]**

1. Applications of Derivatives [4 Hrs.]
2. Partial Derivatives [2 Hrs.]
3. Applications of Anti-derivatives [3 Hrs.]
4. Differential Equations [5 Hrs.]
5. Fourier Series [1 Hrs.]

Evaluation Scheme:

Unit wise Marks division for Final

S. No.	Units	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Applications of Derivatives	4 x 2 = 8	3 x 4 = 12	20
2	Partial Derivatives	2 x 2 = 4	2 x 4 = 8	12
3	Applications of Anti-derivatives	3 x 2 = 6	3 x 4 = 12	18
4	Differential Equations	4 x 2 = 8	4 x 4 = 16	24
5	Fourier Series	1 x 2 = 2	1 x 4 = 4	6
		14 x 2 = 28	**13 x 4 = 52**	**80**

References:

1. Thapa et al., Engineering Mathematics (Volume I, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
2. Bajracharya et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
3. Kryszig E., Advanced Engineering Mathematics, wile-Easter Publication, New Delhhi, India
4. Nath et al., Engineering Mathematics III, Vidhyarthi Publisher & distributors, Kathmandu, Nepal
5. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.

C Programming
EG2101CT

Year: II **Total: 7 hours /week**
Part: I **Lecture: 4 hours/week**
Tutorial: hour/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course deals with the problem-solving techniques using C programming language. It provides the students with the knowledge of the basic features of the C language such as data types, keywords, operators, control structure, array, String handling functions, functions, structure and union, pointer and file handling.

Course objectives:
After completion of this course students will be able to:
1. Implement fundamentals concepts of programming language.
2. Apply sequential, conditional and looping statements while developing programs.
3. Create modular programs using array.
4. Make and apply programs using function, strings, string handling function, structure and union, pointer and data files.

Course Contents:

Theory

Unit 1. Programming Language Fundamentals [6 Hrs.]
- 1.1. Introduction to Program and Programming Language
- 1.2. Types of Programming Language (Low Level and High-Level Language)
- 1.3. Language Translator (Assembler, Compiler and Interpreter)
- 1.4. Program Error, Types of Error (Syntax, Semantic, Runtime Error)
- 1.5. Program Design Tools (Algorithm, Flowchart)

Unit 2. Introduction to C [8 Hrs.]
- 2.1. Overview and History of C
- 2.2. Features, Advantages and Disadvantages of C
- 2.3. Structure of C Program, Compiling Process
- 2.4. Character set used in C, Data types, Variables. C Tokens (Keywords, Identifier, Constants, Operators), Header files, Library function
- 2.5. Preprocessor Directives, Escape Sequence, Comments
- 2.6. Input Output Operation
  - 2.6.1. Formatted input/output function (printf(), scanf())
  - 2.6.2. Unformatted input/output function (getchar(), putchar(), gets(), puts(), getc(), putc())

Unit 3. Operators and Expressions [4 Hrs.]
- 3.1. Operators, Operand, Operation, Expression
- 3.2. Types of Operators (Unary, Binary, Ternary, Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Bitwise, Size-of Operators)

Unit 4. Control Structure/Statement [12 Hrs.]
- 4.1. Sequential Statement
- 4.2. Decision/Selection/Conditional Statement
  - 4.2.1. if statement

4.2.2. if…else statement
4.2.3. if…else if…else statement
4.2.4. Nested if…else statement
4.2.5. Switch statement
4.3. Loop (for, while and do-while)
4.4. Jump statement (break, continue, goto statement)

Unit 5. Array and String **[8 Hrs.]**

5.1. Introduction to Array, Declaration, Initialization
5.2. Types of Arrays (1-D Array, Multi-dimensional Array)
5.3. String, Array of String
5.4. String Handling Function (strlen(), strrev(), strupr(), strlwr(), strcpy(), strcat(), strcmp())

Unit 6. Function **[6 Hrs.]**

6.1. Introduction
6.2. Function components (function declaration, function call, function definition)
6.3. Types of function (library/built-in function and user-defined function)
6.4. Category of function according to return value and arguments
6.5. Parameter passing in C (call by value and call by reference)
6.6. Recursion (recursive function)
6.7. Passing array to function
6.8. Passing string to function

Unit 7. Structure and Union **[6 Hrs.]**

7.1. Structure: definition, declaration, initialization, size of structure
7.2. Accessing member of Structure
7.3. Array of Structure
7.4. Nested Structure
7.5. Union: definition, declaration, size of union
7.6. Structure Vs. Union

Unit 8. Pointer **[4 Hrs.]**

8.1. Introduction to Pointer
8.2. Address (&) and indirection (*) operator
8.3. Pointer Arithmetic Operations
8.4. Pointer to Pointer in C
8.5. Dynamic Memory Allocation (malloc(), calloc(), realloc(), free())

Unit 9. Data files **[6 Hrs.]**

9.1. Introduction to data files
9.2. Types of files (text file, binary file)
9.3. File handling operation
9.4. Opening and closing file
9.5. Creating file
9.6. Library functions for READING from a file and WRITING to a file: (fputs, fgets, fputc, fgetc fprintf, fscanf)

Practical: **[45 Hrs.]**

1. Write programs to implement sequential structure.

2. Write programs to implement conditional structure.
3. Write programs to implement looping structure.
4. Write programs to implement array and string handling function.
5. Write programs to implement library function, user defined function and recursive function.
6. Write programs to implement structure and union.
7. Write programs to implement pointer.
8. Write programs to read from a file and write to data file using fputs, fgets, fputc, fgetc fprintf, fscanf function.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Programming Language Fundamentals	6	8
2	Introduction to C	8	11
3	Operators and Expressions	4	5
4	Control Structure/Statement	12	16
5	Array and String	8	11
6	Function	6	8
7	Structure and Union	6	8
8	Pointer	4	5
9	Data files	6	8
	Total	**60**	**80**

* There may be minor deviation in marks distribution.

References:

1. Gotterfried, B. (2001). Programming with C. (3rd ed.). India: Mcgraw Hill Education.
2. Bhatta, R.D. (2015). A Text Book of C Programming. (3rd ed.). Nepal: Vidyarthi Pustak Bhandar.
3. Thareja, R. (2015). Introduction to C Programming. (2nd ed.). India: Oxford University Press.
4. Kantekar, Y. (2012). Let us C. (10th ed.). India: BPB Publications.
5. Balagurusamy, E. (2008). Programming in ANSI C. (6th ed.). India: The McGraw Hill Companies.

Web Technology I

EG2102CT

Year: II **Total: 7 hours/week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course is designed to provide skills to the student to develop modern web application and gain a broad understanding of the Web Technology. This course focuses on the development of dynamic web contents and applications to facilitate information distribution. The course will initiate students to the different web development tools and technology such as HTML, HTML 5, CSS, JavaScript and GUI based tools.

Course objectives:

After completion of this course students will be able to:

1. Familiarize with the basic technique of web technology and web page design
2. Use recent web development software to develop dynamic web contents and applications
3. Design the client-side web site with features of control of client side.

Course Contents:

Theory

Unit 1. Internet & Web [5 Hrs.]

1.1. History of Internet and Web
1.2. Uses of Internet and Services
1.3. Introduction to WWW
1.4. Component of WWW (Web, Webpage, Website, Homepage, Web Browsers, Web Servers, URL and Search Engines)
1.5. Types of Web Pages & its Processing in WWW
1.6. Internet protocols (TCP/IP, ARP, HTTP, FTP, SMTP, POP, SNMP) and applications

Unit 2. Hypertext Markup Language (HTML) [15 Hrs.]

2.1. Introduction to HTML
2.2. Basic Structure of HTML (HTML, HEAD, TITLE, BODY)
2.3. BODY Attributes (Forecolor: TEXT and Background color: BGCOLOR, Background Image, Background Sound)
2.4. HTML Elements
2.5. HTML TAGS and Attributes
  2.5.1. Singular Tags
  2.5.2. Paired Tags
2.6. Character formatting
  2.6.1. Heading Tag (H1 to H6) and attribute (ALIGN)
  2.6.2. Paragraph Tag and attribute (ALIGN)
  2.6.3. Line Break (BR)
  2.6.4. Horizontal Rule (HR) and attribute (ALIGN, SIZE, WIDTH, NOSHADE)
  2.6.5. Comment in HTML (<!>)
  2.6.6. Text Formatting (B, I, U, BLOCKQUOTE, Q, PREFORMATTED, SUB, SUP, EM, STRIKE, SMALL, BIG, CENTER)
2.7. FONT tag and Attributes (COLOR, FACE and SIZE)

2.8. List Tags and Attributes
  2.8.1. Ordered List: OL, LI, and OL Attributes (TYPE - 1, I, i, A, a, START, VALUE)
  2.8.2. Unordered List: UL, LI, and UL Attributes (TYPE- Disc, Circle, Square)
  2.8.3. Definition List: DL, DT, DD
2.9. Inserting IMAGES and OBJECTS
  2.9.1. Images: IMG; Attributes (ALIGN, SRC, WIDTH, HEIGHT, ALT, BORDER)
  2.9.2. Objects: OBJECT; Attributes (DATA, WIDTH, HEIGHT)
2.10. MARQUEE tag and attributes
2.11. HYPERLINK and Anchor Tag
  2.11.1. Creating Internal Links: Links to other places in the same HTML documents
  2.11.2. Creating Local Links: Link to other HTML documents or data objects
  2.11.3. Creating Global Links: Links to places in other HTML documents
  2.11.4. Anchor Tag and Hyperlink<A HREF TARGET>and<A NAME>
  2.11.5. Creating Image Links
2.12. TABLE Tag
  2.12.1. Creating TABLE, TR, TH and TD and attributes (ALIGN, CELLSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER)
2.13. FRAME and FRAMESET Tags
  2.13.1. FRAMESET tag and Attributes (ROWS, COLS and Absolute dimensions, Percentage dimensions, Relative dimensions)
  2.13.2. FRAME tag and Attributes (SRC, NAME, MARGIN HEIGHT, MARGIN WIDTH, SCROLLINGAUTONORESIZE)
  2.13.3. NOFRAMES tag
2.14. HTML FORM
  2.14.1. FORM tag and attributes (METHOD, ACTION, TARGET)
  2.14.2. INPUT element and attributes (TYPE – TEXT, PASSWORD, CHECKBOX, HIDDEN, IMAGE, FILE, RANGE, RADIO, RESET, SUBMIT, BUTTON; VALUE, SRC, CHECKED, SIZE, MAXLENGTH, ALIGN)
  2.14.3. SELECT, OPTION Tag and attributes (NAME, SIZE, MULTIPLE / SINGLE, SELECTED)
  2.14.4. TEXT AREA Tag and attributes (ROWS, COLS, READ ONLY, DISABLED)

Unit 3. HTML 5 and Features [5 Hrs.]

3.1. Introduction
3.2. Difference between HTML and HTML 5
3.3. HTML 5 New Semantics Elements (HEADER, FOOTER, SECTION)
3.4. HTML 5 New Elements
  3.4.1. Tables, Images, Colors, Canvas, Forms
  3.4.2. Interactive Elements
  3.4.3. Graphics
  3.4.4. Multimedia

Unit 4. HTML Editors and Tools [5 Hrs.]

4.1. Introduction to HTML Editors and HTML Converters
4.2. HTML Editors and tools
  4.2.1. Use of different HTML editors and tools like Dreamweaver, Microsoft Front Page Notepad++, etc.
4.3. Graphical and Animation Tools
  4.3.1. Use of different graphical and animation tools like Adobe Photoshop, MS Paint, Flash, etc.
  4.3.2. Adding Sounds and Animation to the web page (using embed tag)

Unit 5. Cascading Style Sheet (CSS) [5 Hrs.]

5.1. Introduction to Cascading Style Sheets (CSS) and advantages of using CSS
5.2. Basic Syntax
  5.2.1. Creating Cascading Style Sheets (CSS) using STYLE tag
5.3. Types of Style Sheets
  5.3.1. Inline Style Sheets
  5.3.2. Internal/ Embedded Style Sheets
  5.3.3. External Style Sheets
5.4. Introduction to different Styles and their Attributes
  5.4.1. Backgrounds and Color Styles and Attributes
  5.4.2. Fonts and Text Styles and Attributes
  5.4.3. Margin, Padding and Border Styles and Attributes
  5.4.4. List Styles and Table Layouts
  5.4.5. Additional Features - Grouping Style Sheets, Assigning Classes and Span
  5.4.6. DIV Tag
  5.4.7. Responsive Web Design

Unit 6. Introduction to Server Side and Client-Side Scripting [2 Hrs.]

6.1. Overview of Server Side and Client-Side Scripting
6.2. Difference between Server Side and Client-Side Scripting
6.3. Advantages and Disadvantages of Server Side and Client-Side Scripting

Unit 7. JavaScript [8 Hrs.]

7.1. Overview of JavaScript
7.2. Advantages of JavaScript
7.3. Implementing JavaScript code to HTML page using SCRIPT tag
7.4. Variables in JavaScript
7.5. JavaScript Data Type-Variant subtypes
7.6. JavaScript Functions
7.7. Event Handling and JavaScript objects
7.8. Document Object Model in JavaScript
  7.8.1. Browser Objects and Events
  7.8.2. Document Objects and Events
  7.8.3. Form Objects and Events
7.9. Dialog Box supported by JavaScript
7.10. Form validation

Practical: [45 Hrs.]

1. Design a simple page using Character formatting i.e. (Heading Tag (H1 to H6), Paragraph Tag, Line Break, Horizontal Rule, Text Formatting (B, I, U, SMALL, BIG,

EM, SUB, SUP, PRE, STRIKE, CENTER and BLOCKQUOTE) and also use FONT tag and Attributes (COLOR, FACE and SIZE) using HTML.

2. Demonstrate the use of different LIST and their attributes using HTML.
3. Demonstrate the use of TABLE (use ALIGN, CELLSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER attributes) using HTML.
4. Demonstrate the use of HYPERLINK (use internal link, local link, global link and image link) in HTML.
5. Create a page containing 3 FRAMES with 1st frame covering 40% of the screen (vertical coverage) and remaining screen should be horizontally divided into 2 frames (40% and 60%). The 1st frame should contain a banner image and 2nd frame contains the links (i.e. link1 and link2) and the links of these items must be opened in the 3rd frame. Use FRAMESET and FRAME tags of HTML to create the pages.
6. Design a FORM containing username, password, radio button, checkbox, drop-down menu, textarea (for comment section), submit button, and reset button using HTML.
7. Demonstrate the use of different types of CSS in HTML.
8. Demonstrate the use of class and div tags in HTML.
9. Demonstrate the use of JavaScript code to the html page.
10. Develop a simple web site with different simple web pages.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Internet & Web	5	10
2	Hypertext Markup Language (HTML)	15	24
3	HTML 5 and Features	5	8
4	HTML Editors and Tools	5	8
5	Cascading Style Sheet (CSS)	5	10
6	Introduction to Server Side and Client-Side Scripting	2	5
7	JavaScript	8	15
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Bayross, Ivan (New Edition), HTML, DHTML, JavaScript & PHP, BPB publications
2. Kamal Raj, “Internet & Web Design”, Tata McGraw Hill Wiley, Chris Bates, Web programming Dreamtech India Pvt. Ltd
3. Keith Jeremy, “HTML5 for Web Designers”

Digital Logic
EG2103CT

Year: II **Total: 5 hours/week**
Part: I **Lecture: 3 hours/week**
Tutorial: hour/week
Practical: hours/week
Lab: 2 hours/week

Course Description:
This course introduces logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of digital signal, number system, logic gates, minimization techniques, and combinational as well as sequential circuits and concludes with digital logic families and digital displays.

Course Objective:
After completing this course, the students will be able to:
1. Design the combinational logic circuits
2. Explain the sequential logic circuits
3. Design problem based / predefined logic-based circuits

Course Contents:

Theory

Unit 1. Introduction to Digital Signal **[3 Hrs.]**
- 1.1. Analog Signal and Digital Signal
- 1.2. Advantages of Digital over Analog Signals
- 1.3. Representation of Digital Signal
- 1.4. Applications of Digital Signal

Unit 2. Number Systems and Codes **[4 Hrs.]**
- 2.1. Two State Devices
- 2.2. Decimal Number System
- 2.3. Binary Number System
- 2.4. Octal Number System
- 2.5. Hexadecimal Number System
- 2.6. Conversions among Different Number Systems
- 2.7. Fractions Conversion
- 2.8. BCD Code
- 2.9. Gray Code
- 2.10. Alphanumeric Code
  - 2.10.1. ASCII Code
  - 2.10.2. EBCDIC Code

Unit 3. Arithmetic Logic Operations **[5 Hrs.]**
- 3.1. Binary Arithmetic
  - 3.1.1. Binary Addition
  - 3.1.2. Binary Subtraction
- 3.2. r's Complement and (r-1)'s Complement Method for decimal and binary system

Unit 4. Logic Gates and Boolean Function **[10 Hrs.]**
- 4.1. Basic Gates: AND, OR, NOT
- 4.2. Universal Gates: NAND, NOR
- 4.3. Exclusive Gates: XOR, XNOR

4.4. DeMorgan's Theorems
4.5. The Universal Properties of the NAND Gates
4.6. The Universal Properties of the NOR Gates
4.7. Pulse Operation in Logic Gates
4.8. Combination of Logic Gates
4.9. Boolean Algebra and its Properties/Laws
4.10. Boolean Expression in Logic Gates
4.11. Simplification of Boolean Expressions

Unit 5. Logic Simplification [5 Hrs.]

5.1. Karnaugh Map
  5.1.1. K-Map Simplification for Two Input Variables
  5.1.2. K-Map Simplification for Three Input Variables
  5.1.3. K-Map Simplification for Four Input Variables
5.2. Sum of Product (SOP) Simplification
5.3. Product of Sums (POS) Simplification
5.4. K-Maps with *Don't Care* Conditions

Unit 6. Combinational Logic Circuits [8 Hrs.]

6.1. Half Adder, Full Adder and Parallel Adder
6.2. Half Subtractors and Full Subtractors
6.3. Decimal to Binary Encoder and Decimal to BCD Encoder
6.4. Binary to Decimal Decoder, BCD to Decimal Decoder and Seven Segment Display Decoder
6.5. Data Transmissions, 4-to-1 Multiplexer and 8-to-1 Multiplexer
6.6. Demultiplexer and Decoder Relations
6.7. 1-to-4 Demultiplexer and 1-to- 16 Demultiplexer

Unit 7. Sequential Logic Circuits [8 Hrs.]

7.1. Flip-Flops
  7.1.1. RS Flip-Flop and its Truth Table
  7.1.2. D Flip-Flop and its Truth Table
  7.1.3. JK Flip-Flop and its Truth Table
  7.1.4. T Flip-Flop and its Truth Table
  7.1.5. Master-Slave Flip-Flops
  7.1.6. Applications of Flip-Flop
7.2. Shift-Registers
  7.2.1. Flip-flop as a One-bit Memory Device
  7.2.2. Arithmetic Right/Left Shift Registers
  7.2.3. Serial-in Serial-out (SISO) Shift Register
  7.2.4. Serial-in Parallel-out (SIPO)Shift Register
  7.2.5. Parallel-in Serial-out (PISO)Shift Register
  7.2.6. Parallel-in Parallel-out (PIPO)Shift Register
  7.2.7. Applications of Shift Registers
7.3. Counters
  7.3.1. Synchronous Counters
  7.3.2. Ripple Counters
  7.3.3. M- Modulus Counters
  7.3.4. Decade Counters
  7.3.5. Ring Counters

7.3.6. Applications of Counters

Unit 8. Digital Displays **[2 Hrs.]**

8.1. LED Display
8.2. 7-Segments Display

Practical: **[30 Hrs.]**

1. Verify the truth tables of basic gates and other gates: AND, OR, NOT, NAND, NOR, XOR and XNOR Gates
2. Realize and verify truth tables applying DeMorgan's Theorems
3. Verify the universal properties of the NAND gate and NOR gate.
4. Realize and verify truth tables of binary half adder/Subtractor and full adder/Subtractor
5. Implement decimal to 3-4-bit binary encoder
6. Realizing the function of 4-bit binary decoder
7. Realizing the function of 4-to-1 multiplexer and 1-to- 4 demultiplexer circuits.
8. Realizing the function of flip-flops, RS, D, JK, T flip-flops
9. Realizing the function shift-registers: SISO, SIPO, PISO and PIPO
10. Realizing the function ripple counters
11. Realizing the function synchronous counters
12. Realizing and designing of seven-segment display-decoder logic circuit

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Digital Signal	3	5
2	Number Systems and Codes	4	7
3	Arithmetic Logic Operations	5	9
4	Logic Gates and Boolean Function	10	18
5	Logic Simplification	5	9
6	Combinational Logic Circuits	8	14
7	Sequential Logic Circuits	8	14
8	Digital Displays	2	4
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. M. Morris Mano, "Digital Logic Circuits and Computer Design", Prentice Hall Publication, 4th edition, 2013.
2. T. Flyod, "Digital Fundamentals", Pearson Publication, 11th edition, 2014.
3. Albert Paul Malvino (2006)," Principle of Digital Electronics", The Mc Graw Hill Companies
4. Ananda Kumar, "Fundamental of Digital Circuits", Prentice Hall –India, 2nd edition, 2013.

Discrete Structure

EG2104CT

Year: II **Total: 4 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: … hours/week

Course description:

This course is designed to cover fundamental concepts of discrete structure like logic, proofs, sets, relations, functions, counting, and probability, with an emphasis on applications in computer science with an emphasis on applications in computer science.

Course objectives:

After completion of this course students will be able to:

1. Demonstrate critical thinking, analytical reasoning, and problem-solving skills
2. Implement the concepts of Counting, Probability, Relations and Graphs respectively.
3. Construct graphs and charts, interpret them, and draw appropriate conclusions

Course Contents:

Theory

Unit 1. Introduction to Set, Relations and Functions [8 Hrs.]

1.1. Introduction to Set Theory:
  1.1.1. Concept of Sets, Subsets and Power Set
  1.1.2. Set Operations: Union, Intersection, Difference, Cartesian Product, Venn Diagram, Computer Representation of Sets
  1.1.3. Fuzzy Sets and membership functions

1.2. Functions: Basic Concept, Injective and Bijective Functions, Inverse and Composite

1.3. Functions, Graph of Functions, Functions for Computer Science (Ceiling Function, Floor Function, Boolean Function, Exponential Function)

1.4. Relations: Relations and their Properties, N-ary Relations with Applications, Representing Relations, Reflexive, symmetric and transitive relations, Equivalence Relations, Partial Ordering

Unit 2. Logical Reasoning and Proof Techniques [10 Hrs.]

2.1. Logic: Propositional logic, logical connectives, laws of equivalences, Predicate and Quantifiers, Rules of Inference in Propositional and Predicate logic

2.2. Proof Methods: Basic Terminology, Direct and Indirect proof (contraposition, contradiction), Proof by mathematical induction

Unit 3. Automata Theory [8 Hrs.]

3.1. Finite State Automata:
  3.1.1. DFA (Deterministic Finite Automata): Formal Definition, Representation, Design
  3.1.2. NFA (Non-Deterministic Finite Automata): Formal Definition, Representation, Design, NFA to DFA conversion
  3.1.3. Regular Expression: Formal Definition, Design

3.2. Grammar Concept:
  3.2.1. Chomsky hierarchy

3.2.2. Context free grammar: Derivation, Parse TREE, Language computation and Grammar design
3.2.3. Regular grammar to finite Automata and vice versa

Unit 4. Recurrence Relation [7 Hrs.]

4.1. Counting Theory: Sum and Product Rule, Pigeonhole Principle, Permutation and Combination, Binomial Expansion
4.2. Recurrence Relation: Linear Recurrence Relations, Solving linear homogeneous recurrence relation with constant coefficients (upto order two)

Unit 5. Graph Theory [12 Hrs.]

5.1. Graphs: Graph definition and types, Representation (Adjacency list, Adjacency and Incidence Matrix), Degree of Vertex, Handshaking Theorem, Cycle, wheel, Regular graph, Bi-Partite Graph
5.2. Connectivity in Graphs: Paths and circuits, complete graph, Weakly and Strongly connected graph, Euler and Hamilton Graph
5.3. Planar graph and Planar representation of graph, Graph Coloring
5.4. Graph Traversal (BFS and DFS)
5.5. Trees: Introduction and Applications, M-ary tree, Binary Tree and properties, Depth of Tree, Applications, Tree Traversals (Pre-order, Post-order and In-order Traversal)

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Set, Relation and Function	8	14
2	Logical Reasoning and Proof Techniques	10	18
3	Automata Theory	8	14
4	Recurrence Relations	7	12
5	Graph Theory	12	22
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Kenneth H. Rosen. Discrete Mathematics and Its Applications, 7th Edition, McGraw Hill, 2012.
2. R. Johnsonbaugh, “Discrete Mathematics”, Prentice Hall Inc.
3. Joe L. Mott, Abrahan Kandel, and Theodore P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice-Hall of India

Software Engineering

EG2105CT

Year: II **Total: 5 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course Description:

This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. One will study the tools and techniques used in analysis and design of software systems, and apply those tools within a recognized software.

Course Objectives:

After completing this course, the students will be able to:

1. Introduce the theory and foundations of software engineering
2. Explain Software Project Management
3. Describe some key aspects of a software engineering process
4. Apply fact-finding and problem-solving skills
5. Determine the requirements for a software system
6. Enlist/Explain key aspects of models and processes for design of a software system
7. Apply current trends in the area of software engineering

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Introduction to software
1.2. Program Vs software
1.3. Software components
1.4. Characteristics of software
1.5. Types of software
1.6. Generic view of software engineering

Unit 2. Software Development Life Cycle Models **[7 Hrs.]**

2.1. Build and fix model
2.2. The waterfall model
2.3. Prototyping model
2.4. Iterative enhancement model
2.5. Spiral model
2.6. Rapid application development model (RAD)
2.7. Selection criteria of a lifecycle model

Unit 3. Software Project Management **[7 Hrs.]**

3.1. Activities in project management
3.2. Software project planning
3.3. Software project management plan
3.4. Software project scheduling and Time Line Charts
3.5. Software project team management and organization
3.6. Software Project estimation

3.6.1. LOC Based Estimation
3.6.2. FP Based Estimation
3.6.3. COCOMO model
3.7. Risk analysis and management
3.8. Risk management process
3.9. Software configuration management

Unit 4. Software Requirement Analysis & Specification [6 Hrs.]
4.1. Requirement engineering
4.2. Requirement elicitation
4.2.1. Interviews
4.2.2. Brainstorming series
4.2.3. Use case approach
4.3. Requirement analysis
4.3.1. Data flow diagram
4.3.2. Data dictionary
4.3.3. Entity-Relationship diagram
4.4. Requirement documentation
4.4.1. Nature of SRS
4.4.2. Characteristics of a good SRS
4.4.3. Organization of SRS

Unit 5. Software Design [6 Hrs.]
5.1. Objectives of design
5.2. Design framework
5.3. Software design models
5.4. Design process
5.5. Architecture design
5.6. Low level design
5.7. Software design strategies
5.8. Function oriented design Vs Object oriented design

Unit 6. Software Metrics [3 Hrs.]
6.1. Software metrics
6.2. Token count
6.3. Data structure metrics
6.4. Information flow metrics
6.5. Metrics analysis

Unit 7. Software Reliability [2 Hrs.]
7.1. Basic Concepts
7.2. Software quality
7.3. Software reliability model

Unit 8. Quality Management and Testing [7 Hrs.]
8.1. Software quality attributes
8.2. Quality factors
8.3. Quality control
8.4. Quality assurance
8.5. Verification and validation

8.6. Testing and debugging
8.7. Testing process
8.8. Unit testing
8.9. Integration testing
8.10. System testing
8.11. Regression testing
8.12. White Box testing and Black Box testing

Unit 9. Software Maintenance [3 Hrs.]

9.1. Need for software maintenance
9.2. Types of software maintenance
9.3. Software maintenance process model
9.4. Software maintenance cost

Practical: [30 Hrs.]

The practical should contain all features mentioned above.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Software Development Life Cycle Models	7	12
3	Software Project management	7	12
4	Software Requirement Analysis & Specification	6	11
5	Software Design	6	11
6	Software Metrics	3	5
7	Software Reliability	2	5
8	Quality Management and Testing	7	12
9	Software Maintenance	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

Reference:

1. Agarwal, K. and Singh, Y., 2007. *Software Engineering*. (3rd ed). New Delhi: New Age International Publisher.
2. Ghezzi, Jayazeri and Mandrioli(2002). *Fundamentals of Software engineering* (2nd ed).
3. Mall, Rajib(2006).*Fundamentals of Software Engineering* (2nd ed). India: Prentice-Hall of India
4. Sommerville, I. (2010). *Software engineering* (10th ed). Harlow, England: Addison-Wesley.

Basic Electrical and Electronics Engineering

EG2106CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand fundamental concept of electric and electronic circuits.

Course objectives:

After completion of this course students will be able to:

1. Differentiate between active and passive elements and circuits.
2. Identify and explain the working principle of electric circuits.
3. Identify and explain the working principle of electronic circuits.

Course Contents:

Theory

Unit 1. Basic Electric System [6 Hrs.]

1.1. Constituent parts of an electric system (Source, Load, Communication and Control)
1.2. Current flow in a circuit
1.3. Electromotive Force and Potential Difference
1.4. Electrical Units
1.5. Passive Components: Resistance, Inductance & Capacitance, Series and Parallel Combinations
1.6. Voltage and Current Sources: Independent, Dependent, VCVS, VCCS, CCCS, CCVS
1.7. Ohm's Law
1.8. Temperature rise and Temperature Coefficient of Resistance

Unit 2. DC Circuits and Network Theorems [6 Hrs.]

2.1. Power and Energy
2.2. Kirchhoff's Law and Its Application: Nodal Analysis and Mesh Analysis
2.3. Star – Delta and Delta – Star Transformation
2.4. Superposition Theorem
2.5. Thevenin's Theorem
2.6. Norton's Theorem
2.7. Maximum Power Transfer Theorem
2.8. Reciprocity Theorem

Unit 3. Alternating Quantities [4 Hrs.]

3.1. AC system
3.2. Waveform, Terms and Definitions
3.3. Average and rms values of Current and Voltage
3.4. Phasor Representation

Unit 4. Single – Phase AC Circuits [4 Hrs.]

4.1. AC in Resistive Circuits
4.2. Current and Voltage in an Inductive circuit

4.3. Current and Voltage in an Capacitive circuit
4.4. Concept of Complex Impedance and Admittance
4.5. AC Series and Parallel Circuits
4.6. RL, RC and RLC Circuit Analysis and Phasor Representation

Unit 5. Power in AC Circuits [5 Hrs.]

5.1. Power in Resistive Circuits
5.2. Power in Inductive and Capacitive Circuits
5.3. Power in Circuits with Resistance and Reactance
5.4. Active and Reactive Power: Power Factor, Importance and Measurement of Power Factor

Unit 6. Diode [6 Hrs.]

6.1. Conductor, Insulator and Semiconductor
6.2. Types of Semiconductors: Intrinsic and Extrinsic, P type and N type
6.3. Semiconductor Diode Characteristics
6.4. Diode Circuits: Clipper and Clamper Circuits
6.5. Zener Diode, LED, Photodiode, Varacter Diode, Tunnel Diode
6.6. DC Power Supply: Rectifier (Half – Wave and Full - Wave), Zener Regulated Power Supply

Unit 7. Transistor [6 Hrs.]

7.1. BJT: Types, Configurations, Modes of Operations, Working Principle
7.2. Biasing of BJT
7.3. BJT as an Amplifier and a Switch
7.4. Small and Large Signal Models
7.5. BJT as Logic Gates
7.6. Concept of Differential Amplifier using BJT

Unit 8. MOSFET [4 Hrs.]

8.1. Types and Construction of MOSFET
8.2. Working Principle of MOSFET
8.3. Biasing of MOSFET
8.4. Construction and working of CMOS
8.5. MOSFET and CMOS as Logic Gates

Unit 9. The Operational Amplifier (Op - Amp) [4 Hrs.]

9.1. Basic Model, Ideal and Real Characteristics, Virtual Ground Concept
9.2. Inverting and Non – Inverting Mode Amplifier
9.3. Some Applications: Summing Amplifier, Differentiator, Integrator, Comparator

Practical: [45 Hrs.]

1. Measurement of Voltage, Current and Power in DC Circuits
   a) Verification of Ohm's Law
   b) Temperature Effect in Resistance
2. Kirchhoff's Current and Voltage Law
   a) Evaluate Power from V and I
   b) Note Loading Effects in Meters
3. Measurement of Amplitude, Frequency and Time in Oscilloscope
   a) Calculate and Verify Average and rms Values

b) Examine Phase Relation in RL and RC Circuits

4. Measurement of Alternating Quantities
   a) R, RL, RC Circuits with AV Excitation
   b) AC Power, Power Factor, Phasor Diagram
5. Diode Characteristics, Rectifiers and Zener Diode
6. BJT Characteristics
7. MOSFET Characteristics
8. Voltage Amplifier using OP – Amp, Comparators

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Basic Electric System	6	10
2	DC Circuits and Network Theorems	6	10
3	Alternating Quantities	4	8
4	Single – Phase AC Circuits	4	8
5	Power in AC Circuits	5	8
6	Diode	6	10
7	Transistor	6	10
8	MOSFET	4	8
9	The Operational Amplifier (Op - Amp)	4	8
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. B. L. Theraja and A. K. Theraja, “A Textbook on Electrical Technology”, S Chand, Latest Edition
2. J. R. Cogdell, “Foundations of Electrical Engineering”, Prentice Hall, Latest Edition
3. J. B. Gupta, “A Textbook on Electrical Technology”, Katson, Latest Edition
4. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, Latest Edition
5. Thomas L. Floyd, “Electronic Devices”, Pearson Education, Latest Edition

Second Year/ Second Part

S.N.	Course Code	Subject
1	EG2201CT	Database Management System
2	EG2202CT	Data Structure and Algorithm
3	EG2203CT	Object Oriented Programming in Java
4	EG2204CT	Microprocessor and Computer Architecture
5	EG2205CT	Web Technology II
6	EG2206CT	Statistics and Probability

Database Management System

EG2201CT

Year: II **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course covers the core principles and techniques required in the design and implementation of database systems. It consists of relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present, Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery.

Course objectives:

The main objectives of this course are:

1. Explain the concepts of database and database management system.
2. Provide knowledge of database design using entity relationship diagram.
3. Perform on SQL statements, normalization, transaction processing, and database recovery.

Course Contents:

Theory

Unit 1. Introduction **[5 Hrs.]**

1.1. History, Database and its applications
1.2. Characteristics
1.3. Architecture
1.4. Data abstraction and Independence
1.5. Schemas and Instances
1.6. Classifications of DBMS
1.7. Introduction to DDL, DML, DCL

Unit 2. Data Models **[8 Hrs.]**

2.1. Introduction to Entity Relationship Model
2.2. Entities type
2.3. Entities set
2.4. Attributes and keys
2.5. Relationship types and sets
2.6. E-R diagrams

Unit 3. Normalization **[6 Hrs.]**

3.1. Importance of Normalization
3.2. Functional Dependencies
3.3. Integrity and Domain constraints
3.4. Normal forms (1NF, 2NF, 3NF, BCNF)

Unit 4. Relational Language **[8 Hrs.]**

4.1. Introduction to SQL
4.2. Features of SQL

4.3. Basic Retrieval queries
4.4. INSERT, UPDATE, DELETE queries
4.5. Join, Semi join and Sub queries
4.6. Views
4.7. Relational Algebra
    4.7.1. Select, Project
    4.7.2. Set Operations
    4.7.3. Cartesian Product
    4.7.4. Join

Unit 5. Query Processing **[6 Hrs.]**

5.1. Introduction to Query Processing
5.2. Query Cost estimation
5.3. Query Operations, Operator TREE
5.4. Evaluation of Expressions
5.5. Query Optimization
5.6. Performance Tuning

Unit 6. Transaction and Concurrency Control **[6 Hrs.]**

6.1. Introduction to Transaction
6.2. Serializability concept
6.3. Concurrent execution
6.4. Lock based Concurrency Control
6.5. 2PL and Strict 2PL
6.6. Timestamp concept

Unit 7. Recovery **[6 Hrs.]**

7.1. Failure Classifications
7.2. Recovery and Atomicity
7.3. IN PLACE and Out of Place Update
7.4. Log based Recovery
7.5. Shadow Paging
7.6. Local Recovery Manager
7.7. UNDO and REDO protocol

Practical: **[30 Hrs.]**

1. SQL Queries on CREATE, INSERT, DELETE, and UPDATE operations.
2. SQL query for SELECT operation.
3. SQL query for ALTER operations.
4. SQL queries on JOIN
5. SQL query using aggregate functions.
6. Apply SQL for specifying constraints.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	5	8
2	Data Model	8	14
3	Normalization	6	11
4	Relational Language	8	14
5	Query Processing	6	11

6	Transaction and Concurrency Control	6	11
7	Recovery	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Silberschatz, H.F. Korth, and S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw Hill
2. Ramez Elmasri and Shamkant B. Navathe (2010), Fundamentals of Database Systems, 6 th Edition, Pearson Addison Wesley
3. Raghu Ramakrishnan, and Johannes Gehrke (2007), Database Management Systems, 3rd Edition, McGraw-Hill
4. Jaffrey D. Ullman, Jennifer Widom; A First Course in Database Systems; Third Edition; Pearson Education Limited

Data Structure and Algorithm

EG2202CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course Description:

The purpose of this course is to provide the students with the basic concepts of data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that might occur. This course offers the students a mixture of theoretical knowledge and practical experience.

Course Objectives:

On completion of this course the students will be enabled to:

1. Introduce data abstraction and data representation in memory.
2. Discuss, design and use elementary data structures such as stack, queue, linked list, tree and graph.
3. Decompose complex programming problems into manageable sub-problems.
4. Introduce theory of algorithms and their complexity.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

1.1. Algorithm and its types
1.2. Data structure and its types
1.3. Tools for algorithm analysis (Big O Notation)
  1.3.1. Type of analysis: Time and space complexity
  1.3.2. Asymptotic Notations: Big- O, Big-Ω and Big-θ

Unit 2. Stack and Queue **[6 Hrs.]**

2.1. Stack and Operation
  2.1.1. Continuous implementation of Stack with varying and fixed TOS
2.2. Application of Stack
  2.2.1. Converting Infix to Post fix expression
  2.2.2. Evaluating Post Fix expression
2.3. Queue and Operation
  2.3.1. Definition
  2.3.2. Algorithm of Enqueue and dequeue
  2.3.3. Linear Queue
  2.3.4. Circular Queue
  2.3.5. Priority Queue
  2.3.6. Applications of Queue

Unit 3. List **[8 Hrs.]**

3.1. Definition and Structure of link list
3.2. Advantage and disadvantages of link list

3.3. Operations in Singly Linked list
  3.3.1. Insertion at the beginning and end, after the node, before the node
  3.3.2. Deletion at the beginning and end, after the node, before the node
3.4. Doubly linked list
  3.4.1. Definition
  3.4.2. Structure of doubly linked list
  3.4.3. Insertion at the beginning and end, after the node, before the node
  3.4.4. Deletion at the beginning and end, after the node, before the node
  3.4.5. Advantages and disadvantages

Unit 4. Recursion **[3 Hrs.]**

4.1. Properties of recursion
4.2. Recursion vs Iteration
4.3. TOH and its solution
4.4. Solution of Fibonacci sequence and factorial

Unit 5. Trees **[6 Hrs.]**

5.1. Tree concepts
5.2. Binary tree
5.3. Application of binary tree
5.4. Node representation
5.5. Operation in Binary Tree
  5.5.1. Insertion
  5.5.2. Deletion
5.6. Algorithm of tree search
5.7. Tree traversals
  5.7.1. Pre order
  5.7.2. In order
  5.7.3. Post order
5.8. Height, level and depth of tree and its importance
5.9. AVL balance tree
  5.9.1. Definition
  5.9.2. Detection of unbalance
  5.9.3. Single and double rotation in balancing

Unit 6. Sorting **[6 Hrs.]**

6.1. Definition
6.2. Types of sorting (Internal and external)
6.3. Algorithm of Bubble sort
6.4. Algorithm of Insertion sort
6.5. Algorithm of Selection sort
6.6. Algorithm for Quick sort
6.7. Algorithm for Merge sort
6.8. Algorithm for Heap sort

Unit 7. Search **[7 Hrs.]**

7.1. Sequential search
7.2. Binary search
7.3. Tree search algorithm
7.4. Hashing

7.4.1. Definition
7.4.2. Hash function and Hash table
7.4.3. Collision in Hashing
7.4.4. Collision Resolution Techniques (Open and Closed)

Unit 8. Graph **[7 Hrs.]**

8.1. Components of Graph
8.2. Directed and Undirected
8.3. Connected and Unconnected
8.4. Path and Cycle
8.5. Adjacency sets and tables
8.6. Array based representation
8.7. Linked based and mixed implementation
8.8. Minimum Spanning Trees:
8.8.1. Kruskal's Algorithms and prim's algorithm
8.8.2. Algorithm of graph traversal (Depth First traversal, Breadth First traversal)
8.8.3. Shortest path algorithm

Practical: **[45 Hrs.]**

1. Implement stack using array
2. Implement linear and circular queue
3. Solve TOH & Fibonacci sequence using recursion
4. Implement linked list: singly and doubly
5. Perform basic operations on a binary tree data structure.
6. Implement binary search using function and without function.
7. Implement Hashing for handling the collision.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1.	Introduction	2	4
2.	Stack and Queue	6	11
3.	List	8	14
4.	Recursion	3	5
5.	Trees	6	11
6.	Sorting	6	11
7.	Search	7	12
8.	Graph	7	12
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Agarwal, U. (2012). Data Structure Using C. (3rd ed.). : S K Katari & Sons.
2. Tenenbaum, A.M, Langsam, Y & Augustein, M.J. (1996). Data Structure Using C and C++. (2nd ed.). India: Prentice Hall India.
3. Sahni, S. (2002). Data Structures, Algorithms and Applications in C++. (2nd ed.). India: University Press

Object-Oriented Programming in Java

EG2203CT

Year: II **Total: 8 hours /week**

Part: II **Lecture: 4 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

The purpose of this course is to introduce the concepts Object Oriented Programming using Java programming including introduction, basic structure, classes and objects, inheritance, interfaces, packages, exception handling, and multithreading. At the end, students will be able to write computer programs using different features of Java Programming.

Course objectives:

After completion of this course students will be able to:

1. Implement the concept of Object-Oriented Programming.
2. Implement object, class, inheritance, polymorphism, encapsulation and data abstraction in programming.
3. Implement the problems in Java using Object-Oriented approach.

Course Contents:

Theory

Unit 1. Object-Oriented Programming [3 Hrs.]

1.1. Procedure Oriented Programming
1.2. Object-Oriented Programming
1.3. Procedure Oriented versus Object Oriented Programming
1.4. OOP principles
1.5. Advantages and Disadvantages of OOP

Unit 2. Introduction to Java [2 Hrs.]

2.1. Java as a Programming Platform
2.2. History of Java
2.3. Java Buzzwords
2.4. Java Virtual Machine

Unit 3. Fundamental Programming Structures [10 Hrs.]

3.1. Whitespace, Identifiers, Literals, Comments, Separators and Keywords
3.2. Data Types and Conversion
3.3. Variables
3.4. Constants
3.5. Operators
3.6. Strings
3.7. Control Structures
3.8. Loop
3.9. Methods
3.10. Arrays

Unit 4. Classes and Objects [10 Hrs.]

4.1. Defining Class
4.2. Adding Variables
4.3. Adding Methods

4.4. Static Variables, Methods, Blocks and Class
4.5. Access Control
4.6. Method Parameters
4.7. Creating Objects
4.8. Accessing class members
4.9. Setters and Getters
4.10. Constructors
4.11. Overloading Methods
4.12. Call by value, Call by reference
4.13. this keyword
4.14. final modifier
4.15. Nested Classes
4.16. Wrapper Classes in Java
4.17. Garbage Collection

Unit 5. Inheritance [8 Hrs.]

5.1. Introduction
5.2. Types of Inheritance
5.3. Method Overriding
5.4. Using Super keyword
5.5. Execution of Constructors in Multilevel Inheritance
5.6. Abstract Classes and Methods

Unit 6. Interface and package [8 Hrs.]

6.1. Defining Interfaces
6.2. Extending Interfaces
6.3. Implementing Interfaces
6.4. Accessing Interface Variables
6.5. Introduction to java Packages
6.6. Creating a Package and naming convention
6.7. Using Packages

Unit 7. Exception Handling [6 Hrs.]

7.1. Exceptions and its types
7.2. Exception handling fundamentals (try, catch, throw, throws and finally)
7.3. Using try and catch
7.4. Using throw and throws

Unit 8. Multithreading [6 Hrs.]

8.1. Introduction of Thread
8.2. Creating a Thread
8.3. Thread Priorities
8.4. Life cycle of a Thread (Thread states)

Unit 9. I/O [7 Hrs.]

9.1. Java.io package
9.2. Byte Stream and Character Stream classes
9.3. Using FileInputStream and FileOutputStream classes
9.4. Using FileReader and FileWriter Classes

Practical: **[45 Hrs.]**

1. Install Java Tools.
2. Create and demonstrate programs using control statements and array.
3. Create and demonstrate programs using class, object, methods and constructor.
4. Create and demonstrate programs using inheritance.
5. Create and demonstrate programs using method overloading and method overriding.
6. Create and import Java Packages and Sub-Packages.
7. Create and demonstrate programs using interface.
8. Create and demonstrate programs for exception handling.
9. Create and demonstrate programs for concept of multithreading.
10. Create and demonstrate I/O programs.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Object-Oriented Programming	3	4
2	Introduction to Java	2	3
3	Fundamental Programming Structures	10	13
4	Classes and Objects	10	13
5	Inheritance	8	11
6	Interface and package	8	11
7	Exception Handling	6	8
8	Multithreading	6	8
9	I/O and Java Applets	7	9
	Total	**60**	**80**

* There may be minor deviation in marks distribution.

References:

1. Balaguruswamy, E. (2014). *Programming with JAVA - A Primer: Third Edition.* McGraw-Hill Professionals.
2. David Holmes, K. A. (2005). *THE Java™ Programming Language, Fourth Edition.* Addison-Wesley Professional.
3. Horstmann, C. S. (2018). *Core Java Volume I--Fundamentals.* Pearson.
4. M. T. SOMASHEKARA, D. S. (2017). *OBJECT ORIENTED PROGRAMMING WITH JAVA.* PHI Learning Pvt. Ltd.
5. Mohan, P. (2013). *Fundamentals of Object-Oriented Programming in Java.* CreateSpace Independent Publishing Platform.

Microprocessor and Computer Architecture

EG2204CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: 3 hours/week

Course description:

This course is designed to explore architecture of a microprocessor and its programming in assembly language. The student will be able to apply logics to various given problems and develop programs using assembly language construct that would help them to develop real time microprocessor-based application programs. This course also includes the concept of instruction set architecture, organization or micro architecture and concepts of computer arithmetic.

Course objectives:

After completion of this course students will be able to:

1. Discuss the architecture of 8085 microprocessor and assembly language programming.
2. Demonstrate the basic structure and operation of digital computer.
3. Explain microprogrammed control unit.
4. Explore the concept of pipelining.
5. Discuss data and algorithm used to perform operations on data.

Course Contents:

Theory

Unit 1. Introduction of Microprocessor [8 Hrs.]

1.1. Evolution of microprocessor and it's types
1.2. Microprocessor Bus organization: Data Bus, Address Bus and Control Bus
1.3. Operations of microprocessor: internal data manipulation, microprocessor initiated and peripheral or external initiated
1.4. Pin diagram and internal Architecture of 8085
1.5. Internal registers organization of 8085
1.6. Limitations of 8085

Unit 2. Instruction Cycle and Timing Diagram [3 Hrs.]

2.1. 8085 machine cycles
2.2. Bus timings to fetch, decode, execute instruction from memory
2.3. Memory read and write
2.4. Input/output read and write cycle with timing diagram

Unit 3. 8085 Instruction set [12 Hrs.]

3.1. Machine language instruction format:
  3.1.1. Single byte
  3.1.2. Two bytes
  3.1.3. Three-byte instructions
3.2. Various addressing modes
3.3. Data transfer operation and instruction
3.4. Arithmetic operation and instruction
3.5. Logical operation and instruction

3.6. Branch operation and instruction
3.7. Stack operation and instruction
3.8. Input/output and machine control operation and instruction
3.9. Simple programs with 8085 instructions

Unit 4. Basic Computer Architecture [4 Hrs.]

4.1. Introduction
  4.1.1. History of Computer Architecture
  4.1.2. Overview of Computer Organization
  4.1.3. Memory Hierarchy and cache
4.2. Instruction Codes
4.3. Stored Program Organization
4.4. Indirect address, computer registers
4.5. Common Bus system
4.6. Instruction sets
4.7. Instruction types

Unit 5. Design of Microprogrammed Control Unit [10 Hrs.]

5.1. Control Word, Microprogram, Control Memory
5.2. Control Address Register, Sequencer
5.3. Address Sequencing
5.4. Conditional Branch
5.5. Mapping of Instructions
5.6. Subroutines, Microinstruction Format, Symbolic Microinstructions
5.7. Central Processing Unit
  5.7.1. Introduction
  5.7.2. General Register Organization
  5.7.3. Stack Organization
5.8. Instruction Formats
5.9. Addressing Modes
5.10. RISC vs CISC
5.11. Pipeline and Vector Processing
  5.11.1. Arithmetic and Instruction pipeline
  5.11.2. Vector operations
  5.11.3. Matrix Multiplication, memory interleaving

Unit 6. Computer Arithmetic [3 Hrs.]

6.1. Data Representation
  6.1.1. Fixed point Representation
  6.1.2. Floating point Representation
6.2. Addition and Subtraction with Signed Magnitude Data
6.3. Addition and Subtraction with Signed 2's Complement Data
6.4. Multiplication of Signed Magnitude Data
6.5. Booth Multiplication

Unit 7. Input Output Organization [5 Hrs.]

7.1. Input-Output Interface
  7.1.1. I/O Bus and Interface Modules
  7.1.2. I/O vs. Memory Bus
  7.1.3. Isolated vs. Memory-Mapped I/O

7.2. Asynchronous Data Transfer: Strobe, Handshaking
7.3. Modes of Transfer:
  7.3.1. Programmed I/O
  7.3.2. Interrupt-Initiated I/O
  7.3.3. Direct memory Access
7.4. Direct Memory Access, Input-Output Processor, DMA vs. IOP

Practical: **[45 Hrs.]**

1. Demonstrate 8085 using kit/simulator
2. Implement program to perform arithmetic operations (Add, subtract, multiply and divide) on signed and unsigned two 8-bit numbers.
3. Implement a program to mask the lower four bits of content of the memory location.
4. Implement a program to set higher four bits of content of the memory location to 1.
5. Implement a program to perform Exclusive OR of two numbers.
6. Implement a program to exchange the content of two memory locations.
7. Implement program to add/subtract 16-bit numbers
8. Implement program to copy content of one memory location to another memory location.
9. Implement a program to check whether given no is odd or even.
10. Implement a program to count no of zero value in given block of data.
11. Implement algorithms for computer arithmetic using high level language like C or C++

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction of Microprocessor	8	14
2	Instruction Cycle and Timing Diagram	3	5
3	8085 Instruction set	12	22
4	Basic Computer Architecture	4	7
5	Design of Microprogrammed Control Unit	10	18
6	Computer Arithmetic	3	5
7	Input Output Organization	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Stallings W, Computer Organization and Architecture, 4th Edition, Prentice Hallof India Private Limited.
2. Malvino A.P., Brown J.A., Digital Computer Electronics, 3rd Edition, Tata McGraw Hill Hall
3. D.V, Microprocessors and Interfacing– Programming and Hardware, McGraw Hill
4. Gaonkar R, Microprocessor Architecture, Programming, and application with 8085, Penram International Publication

Web Technology II

EG2205CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

The purpose of this course is to introduce the concepts of Web Technology using PHP programming including introduction, basic structure, classes and objects, inheritance and exception handling. This course also helps to implement database connectivity and manipulation, XML, AJAX and PHP framework. At the end, students will be able to design and develop dynamic web contents and applications.

Course objectives:

After completion of this course students will be able to:

1. Implement PHP for the basic of server-side scripting language
2. Apply PHP and MySQL for the fundamentals of database, database design and their uses in web programming
3. Use XML, AJAX and Content Management Systems

Course Contents:

Theory

Unit 1. Web Server Concept **[5 Hrs.]**

1.1. Introduction to Web Server
1.2. Architecture of web server
1.3. Concept of Dynamic Content
1.4. Using control flow to control dynamic content generation
1.5. Concept of Architecting Web Application

Unit 2. Review of Database: MySQL **[4 Hrs.]**

2.1. Introduction to MySQL
2.2. MySQL queries
  2.2.1. Create
  2.2.2. Insert
  2.2.3. Select
  2.2.4. Update
  2.2.5. Delete
  2.2.6. Alter
2.3. Database Normalization

Unit 3. Server-Side Script: PHP **[12 Hrs.]**

3.1. Introduction of PHP
3.2. Advantage of using PHP for web development
3.3. PHP Installation
3.4. PHP Syntax
3.5. Comments, Variable, Operators, Datatype, Strings, Keywords
3.6. Conditional Statements
3.7. Loop
3.8. Arrays

3.9. Functions
3.10. Passing variables with data between pages
  3.10.1. Get & Post Method
  3.10.2. Cookies
  3.10.3. Sessions
3.11. File Upload: Date, Include, File, File Upload
3.12. Accessing Form Elements, Form Validation
3.13. Exception and Error Handling

Unit 4. Object oriented concept and Database Connectivity [8 Hrs.]

4.1. Classes and Objects
4.2. Access Modifiers
4.3. Constructors and Destructors
4.4. Inheritance and Scope
4.5. Overwriting Methods
4.6. Database Connectivity
  4.6.1. Creating database with Server-Side Script
  4.6.2. Connecting Server-Side Script to Database
  4.6.3. Multiple Connections
  4.6.4. Making queries
  4.6.5. Building in Error Checking
  4.6.6. Fetching Data sets
  4.6.7. Displaying Queries in tables
  4.6.8. Building Forms and control form data using queries

Unit 5. AJAX and eXtensible Markup Language (XML) [8 Hrs.]

5.1. Basic concept of AJAX
5.2. Features of XML
5.3. Structure of XML: Logical Structure, Physical Structure
5.4. Naming Rules
5.5. XML Elements
5.6. XML Attributes
5.7. Element Content Models: Element Sequences i.e., <!ELEMENT counting (first, second, third, fourth)>, Element Choices <!ELEMENT choose (this.one | that.one)>, Combined Sequences and Choices
5.8. Element Occurrence Indicators: -Discussion of Three Occurrence Indicators? (Question Mark) * (Asterisk Sign) + (Plus Sign)
5.9. XML schema languages: Document Type Definition (DTD), XML Schema Definition (XSD)
5.10. XML Style Sheets (XSLT)

Unit 6. PHP Framework [8 Hrs.]

6.1. Introduction
6.2. Features
6.3. Basic DB & Client-Side Validation
6.4. Session & Email System
6.5. Framework with method, Classes and Cookies

Practical: **[45 Hrs.]**

1. Installing required software and platforms for local servers and scripting (IDE, XAMPP, WAMPP, LAMPP etc.)
2. Simple programs using;
   2.1 Control and loops
   2.2 Strings
   2.3 Arrays
   2.4 Functions
3. Passing Information between pages
4. Forms handling, validation etc.
5. Writing to file, reading from file and file upload
6. Examples of sessions and cookies
7. Connecting to database
8. Using various queries on database to extract, insert, update and delete from the web interface
9. Using XML markup elements and its attributes
10. Concept of using simple AJAX in webpage
11. Design and develop a dynamic web page which should include database

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Web Server Concept	5	10
2	Review of database: MySQL	4	8
3	Server-Side Script: PHP	12	20
4	Object oriented concept and Database Connectivity	8	14
5	AJAX and eXtensible Markup Language (XML)	8	14
6	PHP Web Design Framework	8	14
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Bayross "*Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, PHPI*" BPB Publication
2. Hornberger Allen, "*Mastering in PHP*", BPB Publication
3. Converse and Park with Morgan "*PHP MYSQL Bible*" WILEY Publication
4. Sybex "*ASP, ADO and XML Complete*" BPB Publication
5. Russell "*Mastering Active Server Pages* "(BPB)

Statistics and Probability

EG2206CT

Year: II **Total: 4 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: hours/week

Course description:

This course deals with a practical knowledge of the principles and concept of probability and statistics and their application to simple engineering problems.

Course objectives:

After completion of this course students will be able to:

1. Explain the principles and concept of probability.
2. Apply statistics to solve simple engineering problems.

Course Contents:

Theory

Unit 1. Introduction of Statistics [3 Hrs.]

1.1. Origin and development of statistics
1.2. Definition of statistics
1.3. Importance and scope of statistics
1.4. Limitation of statistics

Unit 2. Collection of data. [3 Hrs.]

2.1. Data, types of data
2.2. Methods of collecting primary data
2.3. Sources of secondary data

Unit 3. Classification and Tabulation [3 Hrs.]

3.1. Classification of data
3.2. Meaning and Importance of table
3.3. Parts of table

Unit 4. Diagrammatic and graphic representation [4 Hrs.]

4.1. Difference between diagram and graphs
4.2. Bar diagram and its type
4.3. Histogram and pie diagram
4.4. Graphical representation of data
4.5. Limitation of diagrams and graphs

Unit 5. Summarizing a Data set [8 Hrs.]

5.1. Introduction
5.2. Measures of central tendency (Mean, Medain, Mode, G.M, S.M)
5.3. Partition values (quartiles, deciles, percentiles)
5.4. Measures of description (rage, Q.D., M.D., S.D.)

Unit 6. Bivariate data analysis [8 Hrs.]

6.1. Correlation (karl pearson's coefficient of correlation)
6.2. Lines of regression, equations of regression

Unit 7. Classification and Tabulation **[6 Hrs.]**

7.1. Definition and terminology of probability
7.2. Counting rule (permutation and combination)
7.3. Addition theorem of probability
7.4. Theorem of compound probability or multiplication

Unit 8. Classification and Tabulation **[10 Hrs.]**

8.1. Random variables
8.2. Binomial Distribution
8.3. Poisson distribution
8.4. Normal distribution

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction of Statistics	3	5
2	Collection of data	3	5
3	Classification and Tabulation	3	5
4	Diagrammatic and graphic representation	4	5
5	Summarizing a data set	8	15
6	Bivariate data analysis	8	15
7	Concept of probability	6	10
8	Theoretical probability distribution	10	20
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Dr. Arun Kumar Chaudhary, Aswin 2078, Business statistics, Bhudipuran Prakashan, Bagbazar.
2. S.C. Gupta, 2018, Fundamentals of statistics, Himalaya Publishing House, India
3. H.C. Saxena, 17th edition, Elementary Statistics, S.Chand & CO. Ltd., India

Third Year/ First Part

S.N.	Course Code	Subject
1	EG3101CT	Computer Graphics
2	EG3102CT	Data Communication and Network
3	EG3103CT	Operating System
4	EG3104CT	Computer Repair and Maintenance
5	EG3105CT	Data Mining and data warehousing
6		Elective – I
	EG3106CT.1	a) Geographical Information System
	EG3106CT.2	b) E-commerce
	EG3106CT.3	c) Management Information System
7	EG3107CT	Minor Project

Computer Graphics
EG3101CT

Year: III **Total: 6 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: … hours/week
Lab: 2 hours/week

Course description:
This course deals with graphics hardware, two dimensional and three-dimensional graphics, fundamentals of animation techniques; graphical user interface design, web graphics design and graphics design packages.

Course objectives:
After completion of this course students will be able to:
1. Acquire the knowledge of computer graphics.
2. Familiarize with hardware involved in graphics.
3. Familiarize with the algorithms to generate two-dimensional and three-dimensional graphical objects and animations.

Course Contents:

Theory

Unit 1. Introduction [3 Hrs.]
- 1.1. History of Computer Graphics
- 1.2. Application of Computer Graphics
- 1.3. CAD and CAM

Unit 2. Graphics Hardware [8 Hrs.]
- 2.1. Input Hardware
  - 2.1.1. Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick
- 2.2. Output Hardware
  - 2.2.1. Monitors
  - 2.2.2. Monochromatic CRT Monitors
  - 2.2.3. Color CRT Monitors
  - 2.2.4. Flat Panel Display Monitors
- 2.3. Hardcopy Devices
  - 2.3.1. Plotters
  - 2.3.2. Printers
- 2.4. Raster and Vector Display Architectures, Principles and Characteristics

Unit 3. Two Dimensional Algorithms and Transformations [10 Hrs.]
- 3.1. Mathematical Line Drawing Concept
- 3.2. Line Drawing Algorithms
  - 3.2.1. Digital Differential Analyzer (DDA)
  - 3.2.2. Bresenham's Line Drawing Algorithm
- 3.3. Mid-point Circle Drawing
- 3.4. Mid-point Ellipse Drawing Algorithm
- 3.5. Review of Matrix Operations – Addition and Multiplication
- 3.6. Two-dimensional Transformations
  - 3.6.1. Translation

3.6.2. Scaling
3.6.3. Rotation
3.6.4. Reflection
3.6.5. Shearing
3.7. Two-Dimensional Viewing Pipeline

Unit 4. Three-Dimensional Graphics [16 Hrs.]

4.1. Three-dimensions transformations
4.1.1. Translation
4.1.2. Scaling
4.1.3. Rotation
4.1.4. Reflection
4.1.5. Shearing
4.2. Three-dimensional Viewing Pipeline
4.3. Three-dimensions Projections
4.3.1. Concept of Projection
4.3.2. Projection of 3D Objects onto 2D Display Devices
4.3.3. Three-dimensional Projection Methods
4.3.3.1. Parallel Projection Method
4.3.3.2. Perspective Projection Method
4.4. Three-dimensional Object Representations
4.4.1. Polygon Surfaces
4.4.2. Polygon Tables
4.5. Introduction to Hidden Line and Hidden Surface Removal Techniques
4.5.1. Object Space Method
4.5.2. Image Space Method
4.6. Introduction to Illumination/ Lighting Models
4.6.1. Ambient Model
4.6.2. Diffuse Model
4.6.3. Specular Model
4.7. Introduction to Shading/ Surface Rendering Models
4.7.1. Constant Shading Model
4.7.2. Gouraud Shading Model
4.7.3. Phong Shading Model

Unit 5. Web Graphics Designs and Graphics DesignPackages [5 Hrs.]

5.1. Introduction to graphics file formats
5.2. Principles of web graphics design – browser safe colors, size, resolution, background, anti-aliasing
5.3. Type, purposes and features of graphics packages
5.4. Examples of graphics packages and libraries

Unit 6. Virtual Reality [3 Hrs.]

6.1. Introduction
6.2. Types of Virtual Reality
6.2.1. Non-immersive Virtual Reality
6.2.2. Semi-immersive Virtual Reality
6.2.3. Fully-immersive Virtual Reality
6.2.4. Augmented Virtual Reality
6.2.5. Collaborative Virtual Reality

6.3. Applications of Virtual Reality

Practical: **[30 Hrs.]**

As a part of the laboratory exercise, the students should implement all the algorithms studied in different chapters. At the end, students are required to integrate the codes they have written in earlier practical sessions to create a small project.

The lab contains few sessions dedicated to introduce the students to some of the popular professional graphics packages and CAD packages and explore their features. The course/lab instructor recommends packages to use.

Some algorithm implementation sessions may include:

1. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
2. Implementation of Bresenham's Line Drawing Algorithm.
3. Implementation of mid-point Circle Drawing Algorithm.
4. Implementation of mid -point Ellipse Drawing Algorithm.
5. Implementation of basic 2D transformation.
6. Implementation of basic 3D transformation.
7. Implementation of basic projections.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	3	6
2	Graphics Hardware	8	15
3	Two Dimensional Algorithms and Transformations	10	20
4	Three-Dimensional Graphics	16	25
5	Web Graphics Designs and Graphics Design Packages	5	8
6	Virtual Reality	3	6
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, "Computer Graphics, Principles, and Practice", PHI Edition

Data Communication and Computer Network

EG3102CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand computer networks and digital data communications with a focus on Internet protocols: Application layer architectures (client/server, peer-to-peer) and protocols (HTTP-web, SMTP-mail, etc), Transport layer operation: (reliable transport, congestion and flow control, UDP, TCP); Network layer operation - (routing, addressing, IPv4 and IPv6), Data Link layer operation (error detection/correction, access control, Ethernet, 802.11, Physical Layer operation. Similarly, selected topics such as: network security (Network attack, cryptography, VPN, firewall).

Course objectives:

After completion of this course students will be able to:

1. Gain a good understanding of the architecture of computer networks.
2. Identify and understand various hardware devices and software used in computer networks.
3. Learn different types of protocols used for transmission of data.
4. Use routing and addressing.
5. Setup small home/office networks.

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Definition, Advantages and disadvantages, applications
1.2. Communication system: Analog and digital, Block diagram
1.3. Network as platform, Internet architecture, Trends in networking
1.4. Data Transmission: Analog and digital transmission
1.5. Transmission impairment

Unit 2. Network Architecture and Hardware/Software **[9 Hrs.]**

2.1. Network topologies
2.2. Network types: PAN, LAN, MAN, WAN, Intranet, Internet, Extranet
2.3. Layered network architecture, protocols, interfaces, services
2.4. OSI reference model
2.5. TCP/IP model
2.6. Network workstation and server: Hardware and software requirements
2.7. Client server and peer-to-peer model
2.8. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

Unit 3. Physical Layer **[4 Hrs.]**

3.1. Channel bandwidth and throughput; Propagation time; transmission time
3.2. Transmission media:
  3.2.1. Guided: Coaxial, twisted-pair, fiber-optic
  3.2.2. Unguided: radio waves, microwaves, infrared, satellite
3.3. Introduction of Frame Relay, ATM, ISDN, PSTN and X.25

Unit 4. Data link Layer **[6 Hrs.]**

4.1. Introduction and function of data link layer and its issues
4.2. Framing
4.3. Flow Control issues at data link layer
4.4. Piggybacking and Sliding Window Protocol
4.5. Error Control issues at data link layer
4.6. Error Detection Method and Error Correction Method
4.7. Data Link Layer Protocol: HDLC, PPP

Unit 5. LAN Architectures/standards **[4 Hrs.]**

5.1. Introduction of LAN standards and architecture
5.2. Media access control, MAC address
5.3. ALOHA, FDDI, VLAN, CSMA/CD, Token ring, Token bus and IEEE 802.3, 802.4, 802.1(wireless LAN)

Unit 6. Network Layer **[8 Hrs.]**

6.1. Internetworking
6.2. Circuit switching and packet switching
6.3. Addressing issues at network layer
6.4. IP address, Different classes, Private and Public address
6.5. Subnet mask and sub-netting: Classless addressing; Network Address Translation (NAT)
6.6. Routing and its necessity; static and dynamic routing; interior and exterior routing
6.7. Dynamic routing and Static routing
6.8. Network layer protocols
6.9. Introduction to IPV6 and its necessity

Unit 7. Transport Layer **[4 Hrs.]**

7.1. Transport layer issues:
  7.1.1. Congestion control
  7.1.2. Flow control
  7.1.3. Quality of service
7.2. Transport layer addressing sockets, Port
7.3. Segmentation and reassembly
7.4. Connection oriented and connectionless service
7.5. TCP, UDP

Unit 8. Application Layer **[4 Hrs.]**

8.1. Application layer and its function
8.2. Electronic mail: SMTP, POP3, IMAP
8.3. File transfer: FTP, PUTTY, WinSCP
8.4. Web: HTTP, HTTPs
8.5. Dynamic host configuration protocol (DHCP)
8.6. DNS, WWW

Unit 9. Network Security **[2 Hrs.]**

9.1. Properties of Secure Communication
9.2. Network attacks: Active and Passive attacks

9.3. Cryptography: Symmetric Key and public key, Digital signature
9.4. Firewalls
9.5. Virtual private network

Practical: **[45 Hrs.]**

In practical, students should be able to set up small networks. They should be able to configure network hardware and network software. Following lab exercises may be helpful.

1. Configuration of network interface card and various network devices like hub, switch, router, etc.
2. Cabling: Construction of straight- through and cross-over cable and verify the physical layer connectivity.
3. Configuration of workstation PC
4. Setup peer-to-peer networking and verify it
5. Configuration of server for client server networking; also verify it.
6. Familiarization with basic network commands: Observing IP address and MAC address, Setting IP address and default gateway in PC, Verifying network layer connectivity
7. Configure the PC to obtain IP from DHCP, Release the leased IP, Renew IP (for this there should a DHCP server) -6 and 7 merge
8. Create multiple networks and route packets across multiple networks using static routing
9. Dynamic routing (e.g., RIP) and default route
10. Configure HTTP, FTP, DHCP server and verify it
11. Configuration of DNS and e-mail server
12. Design of local area network (LAN)
13. Case study: Organizational visit to study existing network system

Note: Use packet Tracer software for performing the above practical lab works

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Network Architecture and Hardware/software	9	16
3	Physical Layer	4	7
4	Data link Layer	6	11
5	LAN Architectures/standards	4	7
6	Network Layer:	8	14
7	Transport Layer	4	7
8	Application Layer	4	7
9	Network Security	2	4
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Behrouz Forouzan, “Data Communications and Networking”, Edition 5, Tata McGraw-Hill., 2012.
2. Andrews S. Tanenbaum, David J Wetherall, “Computer Networks”, Edition 5, Pearson Education, 2012.
3. William Stallings, “Data & Computer Communications”, PHI, Edition 6, 2012.

4. Jerry Fitzgerald, Alan Dennis, “Business Data Communications & Networking”, John Wiley & Sons Inc, 2010.

Operating System
EG3103CT

Year: III **Total: 5 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: hours/week
Practical: hours/week
Lab: 2 hours/week

Course description:
This course includes the basic concepts and core structure, functions and design principles of operating system. It consists of the various functions of operating system like process and memory management, file and I/O Management, Deadlock Management and Security. The course gives ideas in designing the operating system and its services.

Course objectives
After completion of this course students will be able to:
1. Describe the functions of operating system.
2. Explain design of the operating system and its components.
3. Demonstrate and simulate the algorithms used in operating system.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**
- 1.1. Operating system and its functions
- 1.2. Evolution of Operating System
- 1.3. Types of Operating System
- 1.4. Operating System Components
- 1.5. Operating System Services: System Call, Shell
- 1.6. Example of Operating System: Unix, Linux, Windows, Handheld OS

Unit 2. Process Management **[10 Hrs.]**
- 2.1. Process Vs Program, Process States, Process Models, Process Control Box
- 2.2. Process Vs Thread, Thread Models, Multithreading
- 2.3. Process Scheduling Criteria, Algorithms and Goals
  - 2.3.1. Batch System: FIFO, SJF, SRTN
  - 2.3.2. Interactive System: RR, HRRN
- 2.4. Critical Section, Race Condition, Mutual Exclusion
- 2.5. Producer Consumer Problem

Unit 3. Memory Management **[10 Hrs.]**
- 3.1. Concept of Multiprogramming
- 3.2. Memory Management functions
- 3.3. Multiprogramming with fixed partition
- 3.4. Multiprogramming with variable partition
- 3.5. Internal Vs External fragmentation
- 3.6. Memory Allocation: First Fit, Worst Fit, Best Fit
- 3.7. Concept of Paging and Page fault

Unit 4. Deadlock Management **[8 Hrs.]**
- 4.1. Deadlock Concept
- 4.2. Deadlock Conditions

4.3. Deadlock Handling Strategies:
  4.3.1. Deadlock Prevention
  4.3.2. Deadlock Detection
  4.3.3. Deadlock Avoidance
  4.3.4. Recovery from Deadlock
4.4. Banker's Algorithm

Unit 5. File and Input/output Management [6 Hrs.]

5.1. File: Naming, Structure, Types, Access, Attributes, Operations, Directory Systems
5.2. File System Layout
5.3. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes
5.4. Principle of I/O Hardware and Software
5.5. Disk Formatting, Disk Arm Scheduling, Stable Storage, Error Handling

Unit 6. Security [5 Hrs.]

6.1. Security Goals
6.2. Security Attacks
6.3. Active and Passive Attacks
6.4. Cryptography Basics
6.5. Access Control
6.6. Protection Mechanisms

Practical: [30 Hrs.]

1. Installation of Virtual Machine, Linux and Windows [4 Hrs.]
2. Linux Basic Commands [2 Hrs.]
3. Implementation of Process Scheduling Algorithms [8 Hrs.]
4. Process Creation, Termination [4 Hrs.]
5. Inter process communication [4 Hrs.]
6. Implementation of Banker's Algorithm [4 Hrs.]
7. Implement some Memory Management Schemes [4 Hrs.]

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Process Management	10	18
3	Memory Management	10	18
4	Deadlock Management	8	13
5	File and I/O Management	6	11
6	Security	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI
2. Stalling William, "Operating Systems", 6th Edition, Pearson Education
3. Silbcrschatz A.,Galvin P., Gagne G., "Operating System Concepts", 8th Edition, John Wiley and Sons

Computer Repair and Maintenance

EG3104CT

Year: III **Total: 5 hours /week**

Part: I **Lecture: 2 hours/week**

Tutorial: hour/week

Practical: hours/week

Lab: 3 hours/week

Course Description:

This course deals about fundamental concept, theories and popular principles of repair and Maintenance systems of computer. The major focus is trouble shooting, repairing and maintenance into real-life by utilizing the knowledge and skill of computer hardware and software. This makes the learning-teaching process more interactive, skillful and interesting.

Course Objectives:

At the end of the course student will be able to

1. Explain basic operation of computer
2. Perform the maintenance of computer, its accessories and peripherals
3. Take Care of computer and its accessories

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

1.1. Definition of Computer, Hardware and software
1.2. Computer Repair and Maintenance
1.3. Importance of Computer Repair and Maintenance
1.4. Hardware maintenance
1.5. Software Based maintenance

Unit 2. System Case **[2 Hrs.]**

2.1. Style and size
2.2. Form Factors
2.3. Switches
2.4. LEDs
2.5. Drive bay

Unit 3. Power Supply **[2 Hrs.]**

3.1. Ratings
3.2. Working Principle
3.3. Block Diagram
3.4. SMPS Concept

Unit 4. Mother Board and System Devices **[2 Hrs.]**

4.1. Form factor
4.2. Parts
4.3. Chipset and controller
4.4. Buses
4.5. BIOS

Unit 5. Processor **[3 Hrs.]**

5.1. Arithmetic Logic Unit (ALU)
5.2. Control Unit, Register
5.3. Buses (Data bus, Address Bus, Control Bus)

Unit 6. UPS **[2 Hrs.]**

6.1. Introduction to UPS
6.2. Importance of UPS
6.3. UPS system Maintenance

Unit 7. Input Devices **[2 Hrs.]**

7.1. Scanner
  7.1.1. Basic operation of Scanner
  7.1.2. Types of Scanners
  7.1.3. Resolution
  7.1.4. Port/slot
7.2. Repair of Scanner

Unit 8. Storage devices **[4 Hrs.]**

8.1. Hard disk (Construction and Operation, Speed, Disk Geometry, Track, Cylinder and sectors, Capacity, Partitioning and Formatting)
8.2. Compact Disk (CD/DVD, Color book Specification, Performance and Reliability, CD/R-W principle)
8.1. External HDDs Vs SSDs

Unit 9. Output devices **[3 Hrs.]**

9.1. Monitor
  9.1.1. CRT (Simple working Principle)
  9.1.2. LED
9.2. Printer
  9.2.1. Basic Operation & Installation of Printer
  9.2.2. Types of Printers
  9.2.3. Resolution
  9.2.4. Port/slot
9.3. Repair of printer

Unit 10. System Care **[8 Hrs.]**

10.1. Preventive Maintenance
  10.1.1.General system care factors
  10.1.2.Cooling and Ventilation
  10.1.3.Power protection
  10.1.4.Data loss and virus protection
10.2. Data problem detection
  10.2.1. Virus detection and protection
  10.2.2. Background of viruses
  10.2.3. Virus scanning and antivirus software
10.3. Backup and Disaster Recovery:
  10.3.1.Risk of data,
  10.3.2.Backup methods devices and media,
  10.3.3.Backup scheduling,

10.3.4. Recovery of data

Practical: **[45 Hrs.]**

1. **Identification and Selection of Required Tools**
   - 1.1. **Physical Assembly procedure:**
     - 1.1.1. Safety procedure
     - 1.1.2. System case selection and preparation
     - 1.1.3. layout of mother board
     - 1.1.4. Secondary storage devices fitting and connections
     - 1.1.5. Memory insertion
     - 1.1.6. Power Connection
     - 1.1.7. Processor and heat sink fitting
     - 1.1.8. Connection of indicators and switches
     - 1.1.9. Setting of jumpers
     - 1.1.10. Insertion of peripheral cards like audio, NIC, Modem, Video Cards etc if necessary
   - 1.2. **Installation of Operating Systems:**
     - 1.2.1. Management of Hard Disk (Partition and formatting)
     - 1.2.2. BIOS setup and installation of Operating system (Windows, Linux etc.)
     - 1.2.3. Installation of Device drivers, Configuration, Installation of Application Programs and antivirus
   - 1.3. **Connecting Multiple Computers Together:**
     - 1.3.1. Construction of UTP cable (Straight through and Cross-cable, connecting through HUB, Switch or Direct connection, Assigning IP numbers and testing of networking
   - 1.4. **Troubleshooting and Repairing Techniques:**

     System Case, LEDs or Case Buttons, Key Lock, Power Sources and Power Protection Devices Cooling fans, air circulation, Motherboard and System Devices, General Failures, CMOS Memory or Real-Time Clock, System BIOS, Resources and Expansion Cards, Processor, System Memory, Memory Not Recognized, Out of Memory Problems, Performance Issues, Video Cards, Failure or Improper Operation, Image Quality Problems, Performance or Video Mode Issues, Monitors, Failure or Improper Operation, Hard Disk Drives, Booting or Operation Problems, Configuration Issues, Disk Compression Issues, Drive Letter Issues, File System Problems, Operating System, CD/DVD- ROM Drives, Drive Not Recognized, Configuration Problems, Audio Issues, Peripheral I/O Ports, Keyboards, Mice, Modems, Network Card, Operation and Connection Problems, Speed Issues, Applications Program Failure.

2. **Installation and maintenance of peripheral equipment**
   - 2.1. **Printer**
     - 2.1.1. Installation of printer driver
     - 2.1.2. Replacement of tonner/cartridge
     - 2.1.3. Troubleshoot and maintenance of Printer
   - 2.2. **Scanner**
     - 2.2.1. Identification of Scanner component
     - 2.2.2. Connection of scanner
     - 2.2.3. Installation of scanner device

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	3
2	System Case	2	3
3	Power Supply	2	3
4	Mother Board and System Devices:	2	3
5	Processor	3	4
6	UPS	2	3
7	Input devices	2	3
8	Storage Devices	4	5
9	Output Devices	3	4
10	System Care	8	9
	Total	**30**	**40**

* There may be minor deviation in marks distribution.

Reference:

1. Winn, L. Rosch (1994). *The hardware Bible* (3rd Edition). Brady Publishing
2. Peter, Norton (2000). *Introduction to Computers* (4th Edition). New York city: McGraw-Hill Higher Education
3. Mark, Minasi (1998). *The Complete PC Upgrade and Maintenance Guide.* United States: Sybex Inc
4. Mueller, Scott (2015). *Upgrading and Repairing PCs (22nd ed).* Que Publishing

Data Mining and Data Warehousing
EG3105CT

Year: III **Total: 6 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: … hour/week
Practical: … hours/week
Lab: 3 hours/week

Course description:
This course studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. The course will cover all these issues and will illustrate the whole process by examples.

Course objectives:
After completion of this course students will be able to:
1. Explain the concept of Data preprocessing, Data Mining and Data Warehousing
2. Understand Data preprocessing Techniques.
3. Discuss multi-dimensional data representation and OLAP operations
4. Understand the concept and use of clustering, classification, and association rule mining algorithms.
5. Discuss on advanced concept and trends of Data Mining and Data Warehousing.

Course Contents:

Theory

Unit 1. Introduction to Data Mining [5 Hrs.]
- 1.1. Basic concepts of Data Mining
- 1.2. Use and benefits of Data Mining
- 1.3. Application of data mining
- 1.4. Knowledge Discovery Process (KDD)
- 1.5. Data Mining Functionalities
- 1.6. Data Mining System Architecture

Unit 2. Data Preprocessing [5 Hrs.]
- 2.1. Data Objects and attribute types
- 2.2. Statistical description of data
- 2.3. Data Preprocessing Concepts
- 2.4. Data Preprocessing
  - 2.4.1. Data Cleaning
  - 2.4.2. Data Integration
  - 2.4.3. Data Reduction
  - 2.4.4. Data Transformation

Unit 3. Data Warehousing and Online Analytical Processing (OLAP) [8 Hrs.]
- 3.1. Basic concepts of data warehousing
- 3.2. Use and benefits of data warehousing
- 3.3. Application of data warehousing
- 3.4. Characteristics of Data Warehouse
- 3.5. Operational Database Vs. Data Warehouse
- 3.6. Data Warehouse Architecture
- 3.7. Data Warehouse Models: Enterprise Warehouse and Data marts

3.8. Multi-dimensional Data, Data Cube
3.9. Data Warehouse Schemas
  3.9.1. Star Schema
  3.9.2. Snowflake Schema
  3.9.3. Fact Constellation Schema
3.10. Fact tables and Dimensions Tables
3.11. OLAP Operations in Multidimensional data models: Roll-up, Drill-Down, Slice and Dice, and Pivot (Rotate) Operations
3.12. Types of OLAP Servers: ROLAP, MOLAP, HOLAP

Unit 4. Mining Frequent Pattern and Associations [7 Hrs.]

4.1. Frequent patterns, Market basket analysis, Frequent Item sets, Support and Confidence, Association Rules
4.2. Finding Frequent Itemset (Apriori Algorithm)
4.3. Limitation and improving Apriori Algorithm

Unit 5. Classification [8 Hrs.]

5.1. Concept of Classification, Learning and Testing of Classification
5.2. Decision Tree Induction
5.3. Bayesian Classification
5.4. Rule Based Classification
5.5. Linear Regression

Unit 6. Clustering [8 Hrs.]

6.1. Concept and Definition of Clustering
6.2. Clustering Methods and General Characteristics
  6.2.1. Partitioning Method (k-Means, k-Medoids)
  6.2.2. Hierarchical Method (Agglomerative, Divisive)

Unit 7. Data Mining Trends and Applications [4 Hrs.]

7.1. Multimedia Data Mining
7.2. Text mining
7.3. Web Mining
  7.3.1. Web Content Mining
  7.3.2. Web Usage Mining
  7.3.3. Web Structure Mining
7.4. Data Mining support in SQL Server
7.5. Data Mining in Oracle
7.6. Data Mining Standards
7.7. Importance of data mining in Marketing, E- commerce and CRM
7.8. Aspects of Security and Privacy in Data Mining

Practical: [45 Hrs.]

1. Design data warehouse by using SQL Server or Oracle.
2. Implement OLAP operations
3. Implement clustering algorithms K-means and K- medoid by using Weka
4. Implement classification algorithms Naïve-Bayes and decision trees by using Weka
5. Implement regression algorithms by using Weka
6. Implement association mining algorithms by using Weka

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Data Mining	5	8
2	Data Preprocessing	5	8
3	Data Warehousing and Online Analytical Processing (OLAP)	8	16
4	Mining Frequent Pattern and Associations	7	12
5	Classification	8	12
6	Clustering	8	16
7	Data Mining Trends and Applications	4	8
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jiawei Han, Micheline Kamber, Jian Pei; *Data Mining: Concepts and Techniques*, Morgan Kaufman Publication, 3rd Edition
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, *Introduction to DataMining*, Pearson Publication, First Edition
3. Charu C. Agrawal, *Data Mining: The Textbook*, Springer Nature Publication, First Edition
4. Sam Anahory, Dennis Murray, *Data warehousing In the Real World***,** Pearson Education.
5. Alex Berson and Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Tata McGraw Hill, 1st Edition.

Geographical Information System
(Elective I)
EG3106CT.1

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course is designed to introduce students a computer-based GIS, Geographic Information Systems, and its applications to spatial data management as a tool to understand the world by describing and explaining the human relationship to the physical environment.

Course objectives:
After completion of this course students will be able to:
1. Explain GIS, development and components of GIS
2. Explain data capturing techniques
3. Analyze spatial and non- spatial data

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. Historical Background
- 1.2. Scope and application areas
- 1.3. Benefits and importance
- 1.4. Functional components
- 1.5. GIS in Organizations
- 1.6. Elements of GIS

Unit 2. Coordinate System **[4 Hrs.]**
- 2.1. Geographic coordinate system
- 2.2. Map Projections
- 2.3. Commonly used map projection system
- 2.4. projected coordinate system

Unit 3. Data Models **[7 Hrs.]**
- 3.1. Introduction, Common Spatial Data Models
- 3.2. Vector Data, Raster Data
- 3.3. Other Data Models:
  - 3.3.1. TINs
  - 3.3.2. Object Data Model
  - 3.3.3. 3-d Data Model
- 3.4. Data and File Structure

Unit 4. Maps, Digitization and Output **[10 Hrs.]**
- 4.1. Map concept
  - 4.1.1. Map elements
  - 4.1.2. Map layers

4.1.3. Map scales and representation
4.1.4. Map Boundaries and Spatial Data

4.2. Digitizing
4.2.1. The Digitizing Process
4.2.2. Digitizing Errors
4.2.3. Node and Line Snapping

4.3. Reshaping
4.3.1. Line Smoothing and Thinning
4.3.2. Scan Digitizing, Editing Geographic Data
4.3.3. Features Common to Several Layers

4.4. Coordinate Transformation:
4.4.1. Control Points
4.4.2. The Affine Transformation
4.4.3. Other Coordinate Transformations
4.4.4. Caution When Evaluating Transformations
4.4.5. Projection Vs Transformation

4.5. Output: Maps, Digital Data, Metadata

Unit 5. Capturing Data **[5 Hrs.]**

5.1. Different methods of data capture
5.2. Data preparation
5.3. Conversion and integration
5.4. GPS
5.5. Remote Sensing

Unit 6. Spatial Analysis and Terrain Analysis **[9 Hrs.]**

6.1. Introduction
6.2. Selection and Classification
6.3. Proximity Functions and Buffering
6.4. Overlay: Raster Overlay, Vector Overlay
6.5. Terrain Analysis:
6.5.1. Introduction
6.5.2. Slope and Aspect
6.5.3. Hydrologic Functions, Profile Plots, Contour Lines
6.5.4. Viewsheds, Shaded Relief Maps

Unit 7. Spatial Data Infrastructure **[6 Hrs.]**

7.1. SDI concepts and its current trend
7.2. The concept of metadata and clearing house
7.3. Critical factors around SDIs

Practical: **[45 Hrs.]**

1. Handle GIS devices
2. ArcGIS installation
3. Explore interactive GIS, create map layouts, Reuse a custom map layout
4. Build a file geodatabase, Use Arc Catalog utilities, modify an attribute table, Join tables
5. Examine metadata, Work with map projections, learn about vector data formats, Explore sources of vector maps

6. Digitize polygon features, use advanced edit tools, digitize point features, Digitize line features
7. Map Designing using tools

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Coordinate system	4	7
3	Data Models	7	12
4	Map, Digitization and output	10	18
5	Capturing Real World	5	9
6	Spatial Analysis & Terrain Analysis	9	16
7	Introduction to Spatial Data Infrastructure	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. De By R, Knippers R.A, sun Y. Principles of geographic information systems: An introductory textbook, international institute for Geoinformation science and Earth observation, the Netherlands
2. Paul B, GIS Fundamentals: A First Text on Geographic Information Systems Fifth Edition,
3. Chang K.T. Introduction to Geographic Information System

E-Commerce
(Elective I)
EG3106CT.2

Year: II **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course Description:
This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. This course deals with the introduction, different business models for e-Commerce, concept of mobile computing, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Commerce.

Course Objectives:
After completing this course, the students will be able to
1. Explain the steps required to set-up your E-commerce website for advertising purposes
2. Introduce the e-commerce.
3. Identify security issues of e-Commerce and e-commerce related Public Policy.
4. Explain the types of payment system and payment gateway.
5. Describe the legal and ethical issues of e-commerce and cyber law,
6. Familiarize with online marketing.

Course Contents:

Theory

Unit 1. Fundamental concept of e-Commerce [6 Hrs.]
- 1.1. Definition of Electronic Commerce
- 1.2. Scope of Electronic Commerce
- 1.3. Electronic E-commerce and the Trade Cycle
- 1.4. Emergence of Internet and commercial use of Internet
- 1.5. E-commerce Models, Personal web server, Internet information server, ASP page Contain scripts, Contain objects and components, Database access,
- 1.6. Application of E-Commerce

Unit 2. Business Models of e-Commerce [6 Hrs.]
- 2.1. Business to Business (B2B)
- 2.2. Business to Consumer (B2C)
- 2.3. Consumer to Consumer (C2C)
- 2.4. Development of B2B e-commerce
- 2.5. Difference between B2C and B2B e-Commerce
- 2.6. e-Procurement
- 2.7. Just in Time Delivery
- 2.8. Integration with Back-end Information System
- 2.9. Electronic marketing in Business-to-Business
- 2.10. Electronic Data Interchange (EDI)
- 2.11. EDI: The Nuts and Bolts, EDI & Business
- 2.12. Auctions and Services from Traditional to Internet Based EDI

Unit 3. E-marketing and Advertising Concepts [5 Hrs.]

3.1. Define E-marketing
3.2. Explain Traditional Marketing
3.3. Online Marketing vs offline marketing
3.4. Tools for online and offline marketing
3.5. Issues with online marketing
3.6. Model of an online video store

Unit 4. Mobile and Wireless Application [5 Hrs.]

4.1. Define Mobile and wireless
4.2. Growth of Mobile Commerce
4.3. Wireless Application Protocol (WAP)
4.4. Use of technologies for mobile commerce
4.5. Architecture of Wireless Application Protocol
4.6. Generations in Wireless Communications
4.7. Security Issues related to Wireless Communication

Unit 5. The network infrastructure for e-commerce [8 Hrs.]

5.1. Network and internets
5.2. Network routers
5.3. Internet protocol suites
5.4. Internet naming convention, (URLs, TCP, FTP, ISP, Telnet, Search engine)
5.5. Broadband technologies (ADSL, Wi-Fi, LTE (4G), Bluetooth)
5.6. Web-based client/server
5.7. Software agents, Types of software agents
5.8. Internet Security
5.9. Multimedia delivery
5.10. Managerial issues

Unit 6. Electronic Payment System (EPS) [4 Hrs.]

6.1. Define Electronic payment system
6.2. Types of electronic payment system
6.3. Digital token-based E-payment system
6.4. Smart Cards & E-payment systems
6.5. Credit card-based payment systems
6.6. Digital wallet (eSewa, Khalti, ConnectIPS)
6.7. Online banking facilities of banks (Nepali banks)
6.8. Risk factor in electronic payment system

Unit 7. Introduction to Entrepreneurship [6 Hrs.]

7.1. Entrepreneurship development
7.2. Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager
7.3. Attributes and characteristics of a successful Entrepreneur
7.4. Entrepreneurial Culture
7.5. Legal and Ethical Issues

Unit 8. Public Policy [5 Hrs.]

8.1. From legal issues to privacy
8.2. E-commerce related legal incidents

8.3. Ethical and other public policy issues
8.4. Protecting privacy
8.5. Protecting intellectual property
8.6. Internet indecency and censorship
8.7. Taxation and encryption policies
8.8. E-commerce Law
8.9. Forms of Agreement
8.10. Government policies

Practical: **[45 Hrs.]**

1. Project should be done by students in any e-commerce site (the project should include: business model, payment mode, network infrastructure, marketing strategy, SWOT analysis and working process of site) (Refer Amazon, Alibaba, E-bay, Paypal etc.)
2. Study visit to fully developed E-Commerce management organization.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Fundamental concept of E-Commerce	6	11
2	Business Models of e-Commerce	6	11
3	E-marketing and Advertising Concepts	5	9
4	Mobile and Wireless Application	5	9
5	The network Infrastructure for E-commerce	8	13
6	Electronic Payment System (EPS)	4	7
7	Introduction to Entrepreneurship	6	11
8	Public Policy	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Noel Jerke, April 2012. E-Commerce Developer's Guide to Building Community and using Promotional Tools. Sybex Inc.
2. Kenneth C. Laudon and Carol Guercio Traver, (11^{th} edition), 2015. E-commerce 2015 business, technology, society. Pearson
3. Janice Reynolds, (2nd edition, 2015. The Complete E-Commerce Book, Design, Build & Maintain a Successful Web-based Business. Focal Press
4. Amir Manzoor, (1^{st} edition), 2015. E-commerce 2016. Printed in the United States of America.

Management Information System
(Elective I)
EG3106CT.3

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course Description:
The main aim of this course is to introduce the Management of Information Systems (MIS). Managing information systems has become a task for all levels of managers and all function areas of the business. This MIS course is designed to familiarize students with the concepts related to the utilization of information technology in business organizations. This course will focus on technical and managerial aspects of information technology adoption in the organization. This course should provide the student with knowledge of the core principles of MIS, focusing on breadth rather than depth of knowledge. In this course has included case studies, group assignments, and related software exercises that will provide an opportunity to apply MIS concepts to real-world applications.

Course Objectives:
After completing this course, the student will able to:
1. Explain the significance of information systems in organizations, Strategic management processes and the implications for the management.
2. Describe different types of management information systems.
3. Identify the basic technologies used in the field of Management Information System.
4. Explain the developments of electronic commerce and the role of Internet.
5. Describe the processes of developing and implementing information systems.
6. Familiarize with ethical and social issues related to information system.

Course contents:

Theory

Unit 1. Foundation of Information System [7 Hrs.]
- 1.1. Introduction to information system
- 1.2. Role of information system in Business
- 1.3. Components of Information Systems
- 1.4. Types of information systems
- 1.5. Effectiveness and efficiency criteria in information system

Unit 2. An overview of Management Information Systems [6 Hrs.]
- 2.1. Structure of a Management information system
- 2.2. Structure of a Management information system
- 2.3. MIS versus Data processing
- 2.4. Decision Making In MIS
- 2.5. MIS & Information Resources Management

Unit 3. Concept of Planning [8 Hrs.]
- 3.1. Concept of organizational planning
- 3.2. The Planning Process
- 3.3. Computational support for planning

3.4. The importance of planning
3.5. Business applications of information technology
3.6. Information System for Business Operations (SDLC)
3.7. Information System for Strategic Advantage
3.8. Decision Support Systems and its benefits and characteristic

Unit 4. Managing Information Technology [5 Hrs.]

4.1. Enterprise & global management
4.2. Security & Ethical challenges
4.3. Planning & implementing changes
4.4. Information Technology Trends

Unit 5. MIS in functional areas of business [7 Hrs.]

5.1. Accounting information systems
5.2. Geographical information systems
5.3. Human resource information systems
5.4. Inventory information systems
5.5. Manufacturing information systems
5.6. Marketing information systems
5.7. Quality information systems

Unit 6. Information security [6 Hrs.]

6.1. Security threats and vulnerability
6.2. Controlling security threat and Vulnerability
6.3. Management security threat in e-Business
6.4. Disaster management
6.5. MIS and Security Challenges
6.6. Firewall

Unit 7. Knowledge based systems [3 Hrs.]

7.1. Artificial intelligence
7.2. Expert systems
7.3. Neural networks

Unit 8. Office information system [3 Hrs.]

8.1. Nature of office
8.2. Types of office information systems
8.3. Client server computing

Practical: [45 Hrs.]

Project Work:

Students should complete at least one MIS Project on the following Topics by including the above contents.

1. Restaurant Information System
2. College Management System

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Foundation of Information System	7	12

2	An overview of Management Information Systems	6	11
3	Concept of planning	8	14
4	Managing Information Technology	5	10
5	MIS in functional areas of business	7	12
6	Information security challenges in e-Enterprises	6	11
7	Knowledge based systems	3	5
8	Office information system	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Brian (2004). *Introduction to Information System*. New York: MCGRAW HILL.
2. Murdick (1971). *Information System for Modern* Management New Jersey:PHI.
3. Jawadekar,S.S(2019). *Management Information System* (6th ed). India: MC GRAW HILL.

Minor Project

EG3107CT

Year: III **Total: 3 hours /week**

Part: I **Lecture: … hours/week**

Tutorial: … hour/week

Practical: 3 hours/week

Lab: … hours/week

Course description:

This course provides students with an idea of how to transform the theoretical knowledge gained in earlier semesters into practical applications. The students will build a real-life project during this course using the knowledge gained in earlier semesters.

Course objectives:

After completing this course, the students will be able to:

1. Learn and gain the knowledge about the programming tool they used to implement the real-life project.
2. Plan, design, develop and implement the real-life problem as a project.
3. Formulate project documentation and oral presentation for his/her final year project.

Project Overview:

1. Group formation (3-4 persons / group)
2. Project concept development
    a. Finding Project concept
    b. Scope of project
    c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

The project should:

1. Be intended to develop an Computer Engineering solution to a practical problem
2. Be carried out using an engineering approach
3. Emphasize design
4. Be carried out in a group (3-4 person/group)
5. Normally result in the production of a piece of software
6. Include technical documentation based on documentation guideline.
7. Be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. Explain the minor project concept in a class by project teachers.
2. Preliminary selection of topic.
3. Discussion with department regarding the feasibility/practicality of the project (e.g. cost, usefulness, market).
4. Finalization of topic.

5. Submission of the detail proposal (Extensive literature review).
6. After approval by project teachers, start of minor project work in laboratory /home.
7. Monitoring of the work progress by project teachers and report to department.
8. A mid-term progress report should be submitted by the student on the date fixed by department.
9. Presentation of mid-term progress of the minor project along with report.
10. Final presentation of minor project should be conducted by the department and should be evaluated by the project teachers in the presence of other teachers in the related field, not involved in minor projects, but from the same department.
11. Students must submit a group report in the format prescribed below.

Requirements for report writing:
Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt
Font Size: 12 pt (for normal text)
Follow following standard for headings

1. Heading1 (16pt, Bold)
1.1. Heading2 (14pt, Bold)
1.1.1. Heading3 (13pt, Bold)
1.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:
The sequence of contents in a major project report is as follows
1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary
- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.
6. Table of Contents
- The table of contents should list all material following it as well as any material which precedes it.
7. List of Figures (if any)
- The list should use exactly the same captions as they appear below the figures in the text.
8. List of Tables (if any)
- The list should use exactly the same captions as they appear above the tables in the text.
9. List of Symbols (if any)
- The list should provide the detail of the symbols used in the report.
10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    - 11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
      Feasibility, System Requirement)
    - 11.2. Chapter 2: Literature Review
    - 11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    - 11.4. Chapter 4: Result and Analysis
    - 11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
    - The reference material should include the author name, title, year. Do not mention the references of the websites in the report.
13. Appendices (if any)
    - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The marks should be evaluated by project teachers as well as other teachers in the related field on the basis of:

S.N.	Topic	Marks Distribution
1	Proposal Defense	10
2	Mid-term progress report/presentation	20
3	Final project report/presentation	70 (project coordinator =10 supervisor =20 external examiner =40)
	Total	**100**

Detailed evaluation scheme:

S.N.	Topic	Marks Distribution
1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%
4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**

Third Year/ Second Part

S.N.	Course Code	Subject
1	EG3201CT	Multimedia System
2	EG3202CT	Internet of Things
3	EG3203CT	Information Security
4	EG3201MG	Entrepreneurship Development
		Elective – II
5	EG3204CT.1	a) E-Governance
	EG3204CT.2	b) Computer Simulation and Modeling
	EG3204CT.3	c) Artificial Intelligence
6	EG3205CT	Major Project

Multimedia System

EG3201CT

Year: III **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

The main objective of this course is to give the fundamental knowledge of multimedia technologies and cover three main domains of Multimedia Systems: Devices, Systems and applications

Course objectives:

After completion of this course students will be able to:

1. Identify basics of multimedia and multimedia system and its architecture.
2. Understand different multimedia components.
3. Explain file formats for different multimedia components.
4. Analyze the different compression algorithms.
5. Apply different Designing techniques in multimedia system

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Definition
1.2. Uses of multimedia
1.3. Components of multimedia
1.4. Multimedia building blocks
1.5. Multimedia and Personalized Computing
1.6. Medium
1.7. Multimedia system and properties
1.8. Data Streams Characteristics
1.9. Data Stream Characteristics for Continuous Media, Information Units

Unit 2. Sound / Audio System **[3 Hrs.]**

2.1. Concepts of sound system
2.2. Music and speech
2.3. Speech Generation
2.4. Speech Analysis
2.5. Speech Transmission

Unit 3. Images and Graphics **[4 Hrs.]**

3.1. Digital Image Representation
3.2. Image and graphics Format
3.3. Image Synthesis
3.4. Analysis and Transmission

Unit 4. Video and Animation **[4 Hrs.]**

4.1. Video signal representation
4.2. Computer- Based animation
4.3. Animation Language

4.4. Methods of controlling Animation
4.5. Display of Animation
4.6. Transmission of Animation

Unit 5. Multimedia Applications Development [4 Hrs.]
5.1. Multimedia systems development cycle
5.2. Planning and costing
5.3. Designing
5.4. Developing and producing
5.5. Testing and debugging
5.6. Delivering
5.7. User Interface techniques

Unit 6. Data Compression [4 Hrs.]
6.1. Need for data compression
6.2. Compression basics
6.3. Lossless compression
6.4. Lossy compression
6.5. LZW Compression

Unit 7. Designing Multimedia [4 Hrs.]
7.1. Development phases and development team
7.2. Analysis phase
7.3. Design phase
7.4. Development phase
7.5. Implementation phase
7.6. Evaluation and testing phase

Unit 8. Application Subsystem [4 Hrs.]
8.1. Application Subsystem
8.2. Transport subsystem
8.3. Quality of service and resource management
8.4. Trends in collaborative Computing
8.5. Trends in Transport Systems
8.6. Multimedia Database Management System

Unit 9. User Interface [3 Hrs.]
9.1. Basic Design Issues
9.2. Video and Audio at the User Interface
9.3. User- friendliness as the Primary Goal

Unit 10. Synchronization [4 Hrs.]
10.1. Notation of Synchronization
10.2. Presentation Requirements
10.3. Model for Multimedia Synchronization
10.4. Specification of Synchronization

Unit 11. Abstraction for programming [4 Hrs.]
11.1. Abstractions Levels
11.2. Libraries

11.3. System Software
11.4. Toolkits
11.5. Higher Programming Languages
11.6. Object –oriented approaches

Unit 12. Multimedia Application [3 Hrs.]

12.1. Program and Structure
12.2. Media Preparation
12.3. Media Composition
12.4. Media Integration
12.5. Media Communication
12.6. Media Consumption
12.7. Media Entertainment
12.8. Trends in multimedia applications

Practical: [30 Hrs.]

Lab exercises are as follows:

1. To edit various format of Images and give the various effects in images using Adobe Photoshop
2. Vector-based drawing application using Macromedia FreeHand
3. To create different types of animation, use the action script to control the various objects using Macromedia Flash and swish Max
4. To edit and publish the movie in various formats using Adobe Premiere
5. To integrate all the multimedia objects like audio, video, images etc and will able to create different interactive presentations using Macromedia Director

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Sound / Audio System	3	6
3	Images and Graphics	4	7
4	Video and Animation	4	7
5	Multimedia Applications Development	4	7
6	Data Compression	4	7
7	Designing Multimedia	4	7
8	Application Subsystem	4	7
9	User Interface	3	6
10	Synchronization	4	7
11	Abstraction for programming	4	7
12	Multimedia Application	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia

3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia
4. Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, Tata MCGraw Hill

Internet of Things

EG3202CT

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course provides theoretical as well as practical knowledge of fundamentals of Internet of Things to make students capable of designing, implementing and managing the issues of IOT in their personal as well professional life.

Course objectives:

After completion of this course students will be able to:

1. Design and implement fundamentals of IoT.
2. Manage privacy and security issues related to IoT.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**

1.1. Definition
1.2. History of IoT
1.3. IoT Architecture
1.4. IoT Frameworks
1.5. Benefits of IoT
1.6. Applications of IoT

Unit 2. Fundamental Mechanisms and Key Technologies **[8 Hrs.]**

2.1. Identification of IoT Objects and Services
2.2. Structural Aspects of the IoT
2.3. Environment Characteristics
2.4. Traffic Characteristics
2.5. Scalability
2.6. Interoperability
2.7. Security and Privacy
2.8. Open Architecture
2.9. Key IoT Technologies
2.10. Device Intelligence
2.11. Communication Capabilities
2.12. Mobility Support
2.13. Device Power
2.14. Sensor Technology
2.15. RFID Technology
2.16. Satellite Technology

Unit 3. IoT Protocols **[6 Hrs.]**

3.1. Protocol Standardization for IoT
3.2. Efforts
3.3. M2M and WSN Protocols
3.4. SCADA and RFID Protocols
3.5. Unified Data Standards – Protocols

3.6. IEEE 802.15.4
3.7. BACNet Protocol
3.8. Modbus
3.9. Zigbee Architecture
3.10. Network layer
3.11. LowPAN
3.12. CoAP
3.13. Security

Unit 4. IoT with RASPBERRY PI [9 Hrs.]

4.1. Building IOT with RASPERRY PI
4.2. IoT Systems
4.3. Logical Design using Python
4.4. IoT Physical Devices & Endpoints
4.5. IoT Devices
4.6. Building blocks
4.7. Raspberry Pi -Board
4.8. Linux on Raspberry Pi
4.9. Raspberry Pi Interfaces
4.10. Programming Raspberry Pi with Python

Unit 5. IoT Privacy, Security and Governance [6 Hrs.]

5.1. Vulnerabilities of IoT
5.2. Security requirements
5.3. Threat analysis
5.4. Use cases and misuse cases
5.5. IoT security tomography and layered attacker model
5.6. Identity establishment
5.7. Access control
5.8. Message integrity
5.9. Non-repudiation and availability
5.10. Security model for IoT

Unit 6. Real-world applications and case studies [10 Hrs.]

6.1. Real world design constraints and challenges
6.2. Applications and Asset management
6.3. Industrial automation
6.4. Smart Metering Advanced Metering Infrastructure
6.5. Smart grid
6.6. e-Health Body Area Networks
6.7. Commercial building automation
6.8. Smart cities - participatory sensing
6.9. Data Analytics for IoT
6.10. Software & Management Tools for IoT
6.11. Cloud Storage Models & Communication
6.12. APIs
6.13. Cloud for IoT
6.14. Amazon Web Services for IoT

Practical: [45 Hrs.]

1. To Implement the IoT Frameworks

2. To Implement Cloud Storage Models & Communication
3. Interfacing sensors to Raspberry
4. Interfacing Arduino to Bluetooth Module
5. Communicate between Arduino and Raspberry PI using any wireless medium
6. To Design an IOT based system

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Fundamental Mechanisms and Key Technologies	8	14
3	IoT Protocols	6	11
4	IoT with RASPBERRY PI	9	15
5	IoT Privacy, Security and Governance	6	11
6	Real-world applications and case studies	10	18
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011. 3.
4. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
5. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
7. HakimaChaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.

Information Security

EG3203CT

Year: III **Total: 5 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course is designed to introduce basics of Information Security in digital world. It deals with elementary cryptography, protection mechanisms against threats and ways to administer security tools.

Course objectives:

After completion of this course students will be able to:

1. Find information vulnerability and attacks.
2. Use encryption techniques.
3. Get knowledge of program security, network security and database security.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

- 1.1. Information System
- 1.2. Data and Information
- 1.3. Vulnerability and attacks
- 1.4. Security Goals
- 1.5. Security services and mechanisms

Unit 2. Cryptographic Techniques **[10 Hrs.]**

- 2.1. Conventional Cryptographic Techniques
  - 2.1.1. Conventional substitution and transposition ciphers
  - 2.1.2. One-time pad
  - 2.1.3. Block cipher and stream cipher
  - 2.1.4. Steganography
- 2.2. Symmetric and Asymmetric Cryptographic Techniques
  - 2.2.1. Rivest, Shamir, and Adleman (RSA)
  - 2.2.2. Data Encryption Standard (DES)
  - 2.2.3. Advanced Encryption Standard (AES)

Unit 3. Authentication and Digital Signatures **[4 Hrs.]**

- 3.1. Use of Cryptography for authentication
- 3.2. Secure Hash function
- 3.3. Key management-Kerberos

Unit 4. Application Security **[4 Hrs.]**

- 4.1. Types
- 4.2. Security in cloud
- 4.3. Mobile application security
- 4.4. Web application security

Unit 5. Program Security **[4 Hrs.]**

5.1. Non-malicious Program errors
  5.1.1. Buffer overflow
  5.1.2. Incomplete mediation
  5.1.3. Time-of-check to Time-of-use errors
5.2. Viruses
5.3. Trapdoors
5.4. Salami attack
5.5. Man-in-the-middle attacks
5.6. Covert channels

Unit 6. Security in Networks **[8 Hrs.]**

6.1. Threats in networks
6.2. Network Security Controls
  6.2.1. Architecture
  6.2.2. Encryption
  6.2.3. Content Integrity
  6.2.4. Strong Authentication
  6.2.5. Access Controls (Physical and Logical)
  6.2.6. Wireless Security
  6.2.7. Honeypots
  6.2.8. Traffic flow security
6.3. Firewalls
  6.3.1. Design and Types of Firewalls
  6.3.2. Personal Firewalls
  6.3.3. Intrusion Detection System (IDS) and its types
  6.3.4. Intrusion Protection System (IPS)
6.4. Email Security
  6.4.1. PGP
  6.4.2. S/MIME

Unit 7. Database Security **[5 Hrs.]**

7.1. Security requirements
7.2. Reliability and integrity
7.3. Sensitive data
7.4. Inference
7.5. Multilevel database
7.6. Proposals for multilevel security

Unit 8. Security Administration **[8 Hrs.]**

8.1. Security Planning
8.2. Risk Analysis
8.3. Organizational Security policies
8.4. Physical Security
8.5. Legal Privacy and Ethical Issues in Computer Security:
  8.5.1. Protecting Programs and data
  8.5.2. Information and the law
  8.5.3. Rights of Employees and Employers
  8.5.4. Software failures
  8.5.5. Computer Crime

8.5.6. Privacy
8.5.7. Ethical issues in Computer Security
8.5.8. Case studies of ethics

Practical: **[30 Hrs.]**

1. Implement Caesar Cipher.
2. Implement substitution cipher.
3. Implement different cryptographic algorithm (RSA, DES, AES)
4. Implement Firewall.
5. Implement Access control.
6. Implement Digital Signature.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	4
2	Cryptographic Techniques	10	18
3	Authentication and Digital Signatures	4	7
4	Application Security	4	7
5	Program Security	4	7
6	Security in Networks	8	14
7	Database Security	5	9
8	Administering Security	8	14
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography and Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

Entrepreneurship Development
EG 3201 MG

Year: III **Total: 5 Hrs. /week**
Semester: II **Lecture: 3 Hrs./week**
Tutorial: Hr./week
Practical: 2 Hrs./week
Lab: Hrs./week

Course Description:
This course is designed to provide the knowledge and skills on formulating business plan and managing small business. The entire course deals with assessing, acquiring, and developing entrepreneurial attitude; skills and tools that are necessary to start and run a small enterprise.

Course Objectives:
After completion of this course students will be able to:
1. Understand the concept of business and entrepreneurship;
2. Explore entrepreneurial competencies;
3. Analyze business ideas and viability;
4. Learn to formulate business plan with its integral components and
5. Manage small business.

Course Contents:

Theory

Unit 1: Introduction to Business & Entrepreneurship: [9 Hrs.]
- 1.1 Overview of entrepreneur and entrepreneurship
- 1.2 Wage employment, self- employment and business
- 1.3 Synopsis of types and forms of enterprises
- 1.4 Attitudes, characteristics & skills required to be an entrepreneur
- 1.5 Myths about entrepreneurs
- 1.6 Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal

Unit 2: Exploring and Developing Entrepreneurial Competencies: [9 Hrs.]
- 2.1 Assessing individual entrepreneurial inclination
- 2.2 Assessment of decision-making attitudes
- 2.3 Risk taking behavior and risk minimization
- 2.4 Creativity and innovation in business
- 2.5 Enterprise management competencies

Unit 3: Business identification and Selection: [4 Hrs.]
- 3.1 Sources and method of finding business idea(s)
- 3.2 Selection of viable business ideas
- 3.3 Legal provisions for MSMEs in Nepal

Unit 4: Business plan Formulation: **[18 Hrs.]**

4.1 Needs and importance of business plan

4.2 Marketing plan

- Description of product or service
- Targeted market and customers
- Location of business establishment
- Estimation of market demand
- Competitors analysis
- Estimation of market share
- Measures for business promotion

4.3 Business operation plan

- Process of product or service creation
- Required fix assets
- Level of capacity utilization
- Depreciation & amortization
- Estimation office overhead and utilities

4.4 Organizational and human resource plan

- Legal status of business
- Management structure
- Required human resource and cost
- Roles and responsibility of staff

4.5 Financial plan

- Working capital estimation
- Pre-operating expenses
- Source of investment and financial costs
- Per unit cost of service or product
- Unit price and profit/loss estimation of first year

4.6 Business plan appraisal

- Return on investment
- Breakeven analysis
- Risk factors

Unit 5: Small Business Management: **[5 Hrs.]**

5.1 Concept of small business management

5.2 Market and marketing mix

5.3 Basic account keeping

Practical

Unit 1: Overview of Business & Entrepreneurship [2 Hrs.]

1. Collect business information through interaction with successful entrepreneur

Unit 2: Exploring and Developing Entrepreneurial Competencies [2 Hrs.]

- Generate innovative business ideas

Unit 3: Product or service Identification and Selection [2 Hrs.]

1. Analyze business ideas using SWOT method

Unit 4: Business Plan Formulation [22 Hrs.]

1. Prepare marketing plan
2. Prepare operation plan
3. Prepare organizational and human resource plan
4. Prepare financial plan
5. Appraise business plan
6. Prepare action plan for business startup

Unit 5: Small Business Management [2 Hrs.]

1. Prepare receipt and payment account
2. Perform costing and pricing of product and service

E-Governance
Elective II
EG3204CT.1

Year: III **Total: 7 hours /week**
Part: II **Lecture: 3 hours/week**
Tutorial: 1 hours/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course deals with the introduction, different models for e-Governance, concept of e-Governance, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Governance

Course objectives:
After completion of this course students will be able to:
1. Introduce e-Governance.
2. Explain security issues of e-Governance.
3. Describe the legal and ethical issues of e-Governance/ cyber law.
4. Impart knowledge in management and government projects

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. History of e-Governance development
- 1.2. How e-Governance works
- 1.3. Categories of e-Governance
- 1.4. Applications
- 1.5. Global trading environment & adoption of e-Governance
- 1.6. Difference between traditional Government and e-Governance
- 1.7. Advantages and disadvantages of e-Governance
- 1.8. Benefits of e-Government
- 1.9. E-Government life cycle
- 1.10. Online service delivery and electronic service delivery
- 1.11. Maturity and adoption model

Unit 2. Models of e-Governance **[4 Hrs.]**
- 2.1. Major challenges of G2G
- 2.2. e-Governance
- 2.3. Governance to Business(G2B)
- 2.4. Development of G2B Governance
- 2.5. Difference between G2Cand G2B e-Governance
- 2.6. G2C, G2E

Unit 3. e-Governance Infrastructure **[4 Hrs.]**
- 3.1. Applications architecture
- 3.2. Support systems
- 3.3. Data center
- 3.4. Government gateway
- 3.5. Open-source software and free software
- 3.6. Electronic Data Interchange (EDI):

3.6.1. Components of EDI
3.6.2. protocol
3.6.3. EDI standards
3.6.4. Data standards used in EDI
3.6.5. Electronic funds transfer

Unit 4. Mobile Governance [4 Hrs.]

4.1. Application of M-Governance
4.2. Advantage of m-Governance
4.3. Wireless application protocol
4.4. WAP Browser
4.5. Mobile Commerce architecture

Unit 5. Technology for Online business [3 Hrs.]

5.1. IT Infrastructure
5.2. Internet
5.3. Intranet
5.4. Extranet
5.5. VPN, Firewall
5.6. Cryptography
5.7. Digital signature
5.8. Digital certificate
5.9. Hypertext
5.10. Hypermedia
5.11. HTTP

Unit 6. Electronic payment system (EPS) [8 Hrs.]

6.1. Online banking
6.2. Types of EPS
6.3. Security requirement of EPS
6.4. Secure socket layer (SSL)
6.5. Secure electronic
6.6. Transaction (SET)
6.7. Payment gateway
6.8. Online payment processing
6.9. Payment processing Network

Unit 7. Security Issues in e-Governance [4 Hrs.]

7.1. e-Governance Security Issues
7.2. Risks Involved in e-Governance
7.3. e-Governance Security tools
7.4. Protecting e-Governance System
7.5. Biometric
7.6. Client server Network security
7.7. Data and message security

Unit 8. Legal and Ethical Issues [3 Hrs.]

8.1. Issues related to e-Governance
8.2. Legal issues
8.3. Ethical issues

8.4. Taxation

Unit 9. Cyber law **[3 Hrs.]**

9.1. Aims of cyber law
9.2. Salient provisions of cyber law
9.3. Contracting and contract enforcement

Unit 10. Managing and implementing e-Governance **[8 Hrs.]**

10.1. Management and strategy of e-Government systems
10.2. Managing public Data
10.3. Managing and emerging issues for e-Government
10.4. e-Government system life cycle and project assessment
10.5. Analysis of current reality
10.6. Design of new e-Government system
10.7. e-Government Risk assessment and mitigation
10.8. e-Government system construction
10.9. Implementation and beyond
10.10. Developing e-Government hybrids

Practical: **[45 Hrs.]**

Case studies on developed and developing countries on e -Governance development (G2C, G2B and G2G) and report submission.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Models of e-Governance	4	7
3	Infrastructure use in e-Governance	4	7
4	Mobile Governance	4	7
5	Technology for Online business	3	5
6	Electronic payment system (EPS)	8	15
7	Security Issues in e-Governance	4	7
8	Legal and Ethical Issues	3	5
9	Cyber law	3	5
10	Managing and implementing e-Governance	8	15
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Richard Heeks, Implementing and managing e-Government
2. C.S. R Prabhu, e-Governance: Concepts and Case studies, prentice hall of India Pvt. Ltd.
3. J. Satyanarayana, e-Government, prentice hall of India Pvt. Ltd

Computer Simulation and Modeling

Elective II

EG3204CT.2

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course introduces the simulation and modeling approaches which includes the modeling of a system, its validation and verification, and the analysis of simulation output. It also covers the concept of random number generation and queuing theory as well as the study of some simulation language and tools.

Course objectives:

After completion of this course students will be able to:

1. Create a computer simulation of a set of observations based on the physical characteristics of the system.
2. Explore the knowledge to develop and execute their own simulation models of continuous, discrete-event and other simulation methods.
3. Review basic simulation methods and principles applied to the architecting and engineering of complex systems

Course Contents:

Theory

Unit 1. Introduction **[8 Hrs.]**

1.1. System, Model and Simulation
1.2. Continuous and Discrete Systems
1.3. Models of a system and its types
1.4. Simulation study Phases
1.5. Model Development life cycle
1.6. Areas of Application, Advantages and Disadvantages
1.7. Physical and Mathematical Models: Static and Dynamic

Unit 2. Simulation of Continuous and Discrete System **[8 Hrs.]**

2.1. Differential and Partial Differential equations
2.2. Continuous System Models
2.3. Analog Computer, Analog Methods, Hybrid Simulation
2.4. Digital-Analog Simulators
2.5. Feedback Systems

Unit 3. Queuing System **[8 Hrs.]**

3.1. Characteristics and Structure of Basic Queuing System
3.2. Models and Types of a Queuing System
3.3. Queuing notation
3.4. Measurement of Queuing System Performance
3.5. Applications of queuing system

Unit 4. Random Number **[8 Hrs.]**

4.1. Random Numbers and its properties

4.2. Pseudo Random Numbers
4.3. Methods of generation of Random Number
4.4. Tests for Randomness: Uniformity and independence
4.5. Generating discrete distribution
4.6. Inversion, rejection, composition and Convolution

Unit 5. Verification and Validation [6 Hrs.]

5.1. Design of Simulation Models
5.2. Verification of Simulation Models
5.3. Calibration and Validation of the models
5.4. Three-Step Approach for Validation of Simulation Models
5.5. Accreditation of Models

Unit 6. Computer system Simulation and output analysis [4 Hrs.]

6.1. Estimation methods
6.2. Simulation run statistics
6.3. Replication of runs
6.4. Elimination of initial bias
6.5. Simulation tools
6.6. System simulation
6.7. CPU and memory simulation

Unit 7. Software use in Simulation [3 Hrs.]

7.1. Continuous system simulation language (CSSL)
7.2. Simulation in java
7.3. Simulation using GPSS
7.4. Simulation using SSF

Practical [45 Hrs.]

Practical should include the simulation of some real time systems (continuous and discrete event systems), Queuing Systems, Random Number generations as well as study of Simulation Tools and Language (Break down)

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	8	14
2	Simulation of Continuous and Discrete System	8	14
3	Queuing System	8	14
4	Random Number	8	14
5	Verification and Validation	6	11
6	Computer system Simulation and output analysis	4	8
7	Software use in Simulation	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicole, "Discrete Event system

2. simulation", 5th Edition, Pearson Education A.M. Law and W.D. Kelton: Simulation and Modeling and analysis
3. R. Y. Rubinstein, B. Melamed: Modern Simulation and Modeling
4. S. Shakya: Lab Manual on Simulation and modeling

Artificial Intelligence

Elective II

EG3204CT.3

Year: III **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: 0 hours/week

Lab: 3 hours/week

Course description:

This course is designed to introduce basics of artificial intelligent. It covers fundamental concepts artificial intelligence, problem solving, knowledge representation, neural networks, machine learning, natural language processing, machine vision and expert systems.

Course objectives:

The objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Upon the completion students will be able to:

1. Gain fundamental concepts of principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. Investigate applications of AI techniques in expert systems, artificial neural networks and other machine learning models.

Course Contents:

Theory

Unit 1. Introduction [6 Hrs.]

1.1. Artificial Intelligence,
1.2. Hard vs. Strong AI, Soft vs. Weak AI
1.3. Foundations and Applications
1.4. Intelligent Agents:
  1.4.1. Introduction of agents
  1.4.2. Structure of Intelligent agent
  1.4.3. Properties of Intelligent Agents
  1.4.4. PEAS description of Agents
  1.4.5. Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning agent, Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

Unit 2. Problem Solving Methods [12 Hrs.]

2.1. Definition of a Problem, Problem as a state space representation, Problem formulation, Well-defined problems
2.2. Constraint satisfaction problem
  2.2.1. Water jug problem
  2.2.2. N-Queen problem
  2.2.3. Cryptarithmetic problem
2.3. Problem solving by searching
2.4. Types of searching
2.5. Measuring problem solving performance
2.6. General State Space Search
2.7. Uninformed:
  2.7.1. Breadth-First Search

2.7.2. Depth-First Search
2.7.3. Depth-Limited Search
2.7.4. Iterative Deepening depth first Search.

2.8. Informed search:
2.8.1. Greedy Best-First Search
2.8.2. A* Search, Optimality of A*
2.8.3. Local search: Hill Climbing

2.9. Game Playing, Optimal Decisions in Games, Alpha – Beta Pruning, Minimax Algorithm, Tic-Tac –Toe Problem, Stochastic Games

Unit 3. Knowledge Representation and Reasoning [10 Hrs.]

3.1. Definition and importance of Knowledge
3.2. Issues in Knowledge Representation
3.3. Knowledge Representation Systems
3.4. Properties of Knowledge Representation Systems
3.5. Types of Knowledge
3.6. The Role of Knowledge
3.7. Knowledge representation techniques:
3.7.1. Rule Based
3.7.2. Logic based
3.8. Propositional Logic
3.8.1. Syntax and Semantic of propositional logic
3.8.2. Proof by Resolution
3.9. Predicate Logic:
3.9.1. FOPL, Syntax, Semantics, Quantification, horn clauses
3.9.2. Inference with FOPL: By converting into PL (Existential and universal instantiation)

Unit 4. Learning [5 Hrs.]

4.1. Concepts of machine learning
4.2. Rote learning
4.3. Learning by analogy
4.4. Inductive learning
4.5. Explanation based learning,
4.6. Supervised and unsupervised learning
4.7. Learning by evolution (genetic algorithm)

Unit 5. Neural Networks and Natural Language Processing [7 Hrs.]

5.1. Introduction to artificial neural network
5.2. Mathematical model of neural network
5.3. Types of neural network: feed-forward, feed-back, Gate realization using neural network
5.4. Learning in neural networks: Back propagation algorithm, Hopfield network
5.5. Concepts of natural language understanding and natural language generation
5.6. Steps in natural language processing:
5.6.1. Syntax analysis
5.6.2. Semantic analysis
5.6.3. Pragmatic analysis

Unit 6. Expert System and Machine Vision [5 Hrs.]

6.1. Expert System
6.2. Architecture of an expert system
6.3. Stages of expert systems development.
6.4. Concept of Machine Vision
6.5. Steps of machine vision
6.6. Application of machine vision

Practical **[45 Hrs.]**

Laboratory exercises can be conducted in PROLOG or any other high-level programming languages. Laboratory exercise must cover the concepts of:

1. Rule based intelligent agents
2. Inference and reasoning
3. Implementing DFS
4. Implementing BFS
5. Implementing A* search
6. Implementing Tic-Tac Toe
7. Implementing water jug problem
8. Implementing N-queen problem
9. Neural networks, etc. for solving practical problems.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	12
2	**Problem Solving Methods**	12	21
3	Knowledge Representation and Reasoning	12	21
4	Learning	4	7
5	Neural Networks and Natural Language Processing	7	12
6	Expert System and Machine Vision	4	7
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. R. Stuart and N. Peter, Artificial Intelligence A Modern Approach, Pearson
2. E. Rich, K. Knight, Shivashankar B. Nair, Artificial Intelligence, Tata McGraw Hill.
3. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall

Major Project
EG3205CT

Year: III **Total: 8 hours /week**
Part: II **Lecture: … hours/week**
Tutorial: … hour/week
Practical: 8 hours/week
Lab: … hours/week

Course description:
The main aim of this course is to plan and complete project work, related with Computer Engineering under the supervision of an instructor or a supervisor.

Course objectives:
On completion of this course, the students will be able to:

1. Develop the ability to tackle individually a selected problem to a reasonable depth of understanding
2. Develop the ability to organize and produce a professional product using an engineering approach
3. Develop the ability to produce technical documentation to a high standard
4. Develop the ability to produce an analytical report which explains the work carried out by the students in the project and the final product they have developed

Project Overview:
1. Group formation (3-4 persons / group)
2. Project concept development
   a. Finding Project concept
   b. Scope of project
   c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

Description of the Project Work:
The work carried out must be a practical, problem-solving project. It should be a realistic project in the sense that the product should be useful practically as far as possible.

The project should:
- be intended to develop a Computer Engineering solution to a practical problem
- be carried out using an engineering approach
- emphasize design
- be carried out in a group (3-4 person/group)
- normally result in the production of a piece of software
- include technical documentation based on documentation guideline.
- be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. A detailed project proposal to be submitted to the project supervisor for the approval of project work.
2. A mid-term progress report to be submitted to the supervisor. The supervisor must hold an oral presentation of about 10 minutes (including progress preview) to evaluate the mid-term progress of the project work.
3. A final written report will be submitted at the end of project work. There will be a final oral group presentation of about 15 minutes (including demonstration). The project coordinator, the supervisor and the external examiner nominated by the project coordinator will evaluate the submitted report as well as the presentation.

Requirements for report writing:

Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt.
Font Size: 12 pt. (for normal text)
Follow following standard for headings

2. Heading1 (16pt, Bold)

2.1. Heading2 (14pt, Bold)

2.1.1. Heading3 (13pt, Bold)

2.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:

The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary

- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.

6. Table of Contents

- The table of contents should list all material following it as well as any material which precedes it.

7. List of Figures (if any)

- The list should use exactly the same captions as they appear below the figures in the text.

8. List of Tables (if any)

- The list should use exactly the same captions as they appear above the tables in the text.

9. List of Symbols (if any)

- The list should provide the detail of the symbols used in the report.

10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
    Feasibility, System Requirement)
    11.2. Chapter 2: Literature Review
    11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    11.4. Chapter 4: Result and Analysis
    11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
    - The reference should be in IEEE format.
13. Appendices (if any)

    - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually, the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The project coordinator, the supervisor and the external examiner should evaluate the project work and presentation by the following criteria:

S.N.	Topic	Marks Distribution
1	Proposal Defense	20
2	Mid-term progress report/presentation	60
3	Final project report/presentation	120 (Project coordinator =10 supervisor =30 external examiner =80)
	Total	**200**

Detailed Evaluation Scheme

S.N.	Topic	Marks Distribution
1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%

4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**

Experts involved in Curriculum Revision, 2022

1. Prof. Dr. Subarna Shakya, Professor, Pulchowk Campus, IOE, TU
2. Dr. Surendra Shrestha, Reader, Pulchowk Campus, IOE, TU
3. Er. Prabin Shrestha, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
4. Er. Suraj Kumar Hekka, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
5. Er. Anup Bhuju, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
6. Er. Milan Chikanbanjar, Senior Lecturer, Khowpa Engineering College
7. Er. Sangam Gautam, IT Officer, CTEVT sanothimi
8. Anand Kumar Shah, Associate Professor, Pulchowk Campus, IOE, TU
9. Anil Verma, Lecturer, Pulchowk Campus, IOE, TU
10. Sandesh Thapa, Trainer, TITI
11. Nawaraj Poudel, Assistant Professor, CDCSIT, TU, Kirtipur
12. Bhojraj Joshi, Lecturer, Patan Multiple Campus, Lalitpur
13. Akash GC, IT Instructor, KIT
14. Subash Bhuju, Instructor, Nepal Banepa Polytechnic Institute
15. Kumar Prasun, Lecturer, Pulchowk Campus, IOE, TU
16. Sumit Bidari, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
17. Suraj Karki, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
18. Sarbin sayami, Assistant Professor, CDCSIT, TU, Kirtipur
19. Gajendra Sharma, Associate Professor, KU