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