

Engineering Mathematics III

EG2101SH

Year: II

Part: I

Total: 4 hours/week

Lecture: 3 hours/week

Tutorial: 1 hours/week

Practical: hours/week

Lab: hours/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. Fourier'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	$4 \times 2 = 8$	$3 \times 4 = 12$	20
2	Partial Derivatives	$2 \times 2 = 4$	$2 \times 4 = 8$	12
3	Applications of Anti-derivatives	$3 \times 2 = 6$	$3 \times 4 = 12$	18
4	Differential Equations	$4 \times 2 = 8$	$4 \times 4 = 16$	24
5	Fourier Series	$1 \times 2 = 2$	$1 \times 4 = 4$	6
	Total	$14 \times 2 = 28$	$13 \times 4 = 52$	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 Delhi, 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
Part: I

Total: 7 hours /week
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(), strev(),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 file (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 printf, 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
Part: I

Total: 7 hours/week
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, CELSPACING, 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.
- Demonstrate the use of different LIST and their attributes using HTML.
 - Demonstrate the use of TABLE (use ALIGN, CELLSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER attributes) using HTML.
 - Demonstrate the use of HYPERLINK (use internal link, local link, global link and image link) in HTML.
 - 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.
 - Design a FORM containing username, password, radio button, checkbox, drop-down menu, textarea (for comment section), submit button, and reset button using HTML.
 - Demonstrate the use of different types of CSS in HTML.
 - Demonstrate the use of class and div tags in HTML.
 - Demonstrate the use of JavaScript code to the html page.
 - 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:

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

Digital Logic
EG2103CT

Year: II
Part: I

Total: 5 hours/week
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.

PC Troubleshoot and Maintenance
EG2101IT

Year: II
Part: I

Total: 6 hours/week
Lecture: 2 hours/week
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course Description:

This course deals with the fundamental concept, theories and popular principles of repair and maintenance of computer systems. The major focus is troubleshooting, repairing and maintenance of computer systems into real-life by utilizing the knowledge and skill of computer hardware and software.

Course Objectives:

At the end of the course student will be able to:

1. Explain basic operation and role of the computer.
2. Maintain the computer, its accessories and peripherals.
3. Take care of computer and its accessories against viruses and disasters.

Course Contents:

	Theory	
Unit 1. Introduction to Troubleshoot		[1 Hrs.]
1.1. Definition of Troubleshoot		
1.2. Troubleshooting Techniques		
Unit 2. System Case		[1 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		
3.5. Troubleshoot various SMPS problems		
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		
4.6. Troubleshoot BIOS and memory problems in motherboard		
Unit 5. Basic Input Devices Troubleshoot		[1 Hrs.]
5.1. Keyboard		
5.2. Mouse		

- 5.3. Light pen
- 5.4. Other input devices

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

- 6.1. Types of Processors
- 6.2. Generation of Processors
- 6.3. Frequency
- 6.4. Multi-Core Processors
- 6.5. Processor troubleshooting methods

Unit 7. Storage Devices **[6 Hrs.]**

- 7.1. Primary Storage Devices:
 - 7.1.1. RAM (Types, Speed, Access and Time, Size, Error Detection and Correction, Logical Memory Layout)
 - 7.1.2. ROM (PROM, EPROM, EEPROM)
 - 7.1.3. Cache Memory
 - 7.1.4. Flash Memory
- 7.2. Secondary Storage Devices:
 - 7.2.1. Hard disk (Brief History, Construction and Operation, Speed, Disk Geometry, Track, Cylinder and sectors, Capacity, Partitioning and Formatting, Interface IDE/ATA/SATA/SCSI, SSD)
 - 7.2.2. Tools for recovering data in HDD
 - 7.2.3. Compact Disc (CD/DVD/Blue-ray Disc, Color book Specification, Performance and Reliability, CD/R-W principle, interface)

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

- 8.1. Video modes, resolution, color and size
- 8.2. Monochromatic and color CRT
- 8.3. LCD/LED/plasma display

Unit 9. Printers and UPS **[3 Hrs.]**

- 9.1. Impact, non-impact printers
- 9.2. Troubleshot printer problems
- 9.3. Introduction of UPS
- 9.4. Working Principle of UPS

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
 - 10.1.5. System Restoration
- 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, System case selection and preparation, layout of mother board, Secondary storage devices fitting and connections, Memory insertion, Power Connection, Processor and heat sink fitting, Connection of indicators and switches, Setting of jumpers, Insertion of peripheral cards like audio, NIC, Modem, Video Cards etc if necessary.

2. Installation of Operating Systems:

2.1 Management of Hard Disk (Partition and formatting), BIOS setup and installation of Operating system (Windows, Linux etc), Installation of Device drivers, Configuration, Installation of Application Programs and antivirus.

3. Troubleshooting and Repairing Techniques:

3.1 During Initial hardware system setup-

3.1.1 System Case, LEDs or Case Buttons, Key Lock, Power Sources and Power Protection Devices Cooling fans, air circulation, Motherboard and System Devices

3.2 During Hardware Operations-

3.2.1 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,

3.3 During Software Operation-

3.3.1 Operation and Connection Problems, Speed Issues, Applications Program Failure, Virus Detection and Protection (Background of viruses, Virus scanning and Antivirus software), Disaster Recovery (Risk of data, Backup methods devices and media, Backup scheduling, Recovery of data)

Final written exam evaluation scheme			
Unit	Title	Hours	Marks Distribution*
1	Introduction to Troubleshoot	1	1
2	System Case	1	1
3	Power Supply	2	3
4	Mother Board and System Devices	2	3
5	Basic Input Devices Troubleshoot	1	1
6	Processor	3	4
7	Storage Devices	6	8
8	Monitors	3	4

9	Printers and UPS	3	4
10	System Care	8	11
	Total	30	40

* There may be minor deviation in marks distribution.

References:

1. Win Rosch, The hardware Bible 3rd Edition
2. Peter Norton, Introduction to Computers 4th Edition
3. Mark Minasi, The Complete PC Upgrade and Maintenance Guide
4. Scott Mueller, Upgrading and Repairing PCs

Basic Electrical and Electronics Engineering

EG2106CT

Year: II

Part: I

Total: 7 hours /week

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. Kirchoff'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. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, Latest Edition
5. Thomas L. Floyd, “Electronic Devices”, Pearson Education, Latest Edition