

# **BOOKLET - BATCH 2K25**

| Annex D - Batch 2K25 |                                                       |       |              |              |       |       |       |       |       |       |              |        |        |
|----------------------|-------------------------------------------------------|-------|--------------|--------------|-------|-------|-------|-------|-------|-------|--------------|--------|--------|
| Semester             | Subject                                               | SDGs  | PLO-1        | PLO-2        | PLO-3 | PLO-4 | PLO-5 | PLO-6 | PLO-7 | PLO-8 | PLO-9        | PLO-10 | PLO-11 |
| Semester 1           | Functional English                                    | 4     |              |              |       |       |       |       |       | 1:A2  | 2:A3         |        | 3:A1   |
|                      | Linear Circuit Analysis                               | 9     | 1:C2         |              |       | 2:C3  |       |       |       |       |              |        |        |
|                      | Linear Circuit Analysis (Lab)                         | 9     |              |              |       |       |       |       |       | 1:P3  |              |        |        |
|                      | Applications of ICT                                   | 4     | 1:C1<br>2:C2 |              | 3:C3  |       |       |       |       |       |              |        |        |
|                      | Applications of ICT (Lab)                             | 4     |              |              |       |       | 1:P3  |       |       |       |              |        |        |
|                      | Applied Physics                                       | 4     | 1:C1<br>2:C1 | 3:C3         |       |       |       |       |       |       |              |        |        |
|                      | Applied Physics (Lab)                                 | 4     |              | 1:P3         |       |       |       |       |       |       |              |        |        |
|                      | Calculus and Analytical Geometry                      | 4     | 1:C1<br>2:C2 | 3:C3         |       |       |       |       |       |       |              |        |        |
|                      | Electronic Engineering Drawing and Workshop Practices | 9     | 1:P1         |              |       |       | 2:P2  |       |       |       |              |        |        |
| Semester 2           | Communication and Presentation Skills                 | 8     |              |              |       |       |       |       |       |       | 1:A2<br>2:A2 |        | 3:A1   |
|                      | Electronic Devices and Circuits                       | 9     | 1:C2         |              |       | 2:C3  |       |       |       |       |              |        |        |
|                      | Electronic Devices and Circuits (Lab)                 | 9     |              |              |       |       |       |       |       | 1:P3  |              |        |        |
|                      | Linear Algebra and Differential Equations             | 4     | 1:C2         | 2:C3<br>3:C3 |       |       |       |       |       |       |              |        |        |
|                      | Computer Programming                                  | 4     | 1:C2         |              | 2:C3  |       |       |       |       |       |              |        |        |
|                      | Computer Programming (Lab)                            | 4     |              |              |       |       | 1:P3  |       |       |       |              |        |        |
|                      | Pakistan Studies                                      | 5,16  |              |              |       |       |       | 1:C1  | 2:C5  |       |              |        |        |
|                      | Discrete Mathematics                                  | 4     | 1:C2         | 2:C3         |       |       |       |       |       |       |              |        |        |
| Semester 3           | Complex Variables and Transform                       | 4     | 1:C1<br>2:C2 | 3:C3         |       |       |       |       |       |       |              |        |        |
|                      | Digital Logic Design                                  | 9     | 1:C1         | 2:C3         | 3:C3  |       |       |       |       |       |              |        |        |
|                      | Digital Logic Design (Lab)                            | 9     |              |              |       | 1:P4  |       |       |       |       |              |        |        |
|                      | Engineering Management                                | 8,12  |              |              |       |       |       |       |       | 1:C2  | 2:A2         | 3:A5   |        |
|                      | Occupational Health and Safety                        | 3,13  |              | 1:C2         |       | 2:C4  |       |       |       |       |              |        |        |
|                      | Data Structures and Algorithms                        | 8,9   | 1:C2         | 3:C3         | 2:C4  |       |       |       |       |       |              |        |        |
|                      | Data Structures and Algorithms (Lab)                  | 8,9   |              |              |       | 1:P3  |       |       |       |       |              |        |        |
|                      | Electrical Network Analysis                           | 4,9   | 1:C4         | 2:C3         |       |       |       |       |       |       |              |        |        |
|                      | Electrical Network Analysis (Lab)                     | 4,9   |              |              | 1:P2  |       |       |       |       |       |              |        |        |
| Semester 4           | Islamic Studies/Ethics                                | 10,16 |              |              |       |       |       |       | 1:A3  |       | 2:C3         |        |        |
|                      | Probability and Statistics for Engineers              | 4     | 1:C1         | 2:C3         |       | 3:C4  |       |       |       |       |              |        |        |
|                      | Engineering Mechanics                                 | 9     | 1:C2         | 2:C3         |       |       |       |       |       |       |              |        |        |
|                      | Signals and Systems                                   | 8     | 1:C2         | 2:C3         | 3:C5  |       |       |       |       |       |              |        |        |
|                      | Signals and Systems (Lab)                             | 8     |              |              |       |       | 1:P3  |       |       |       |              |        |        |
|                      | Electronic Circuit Design                             | 9     | 1:C1         | 2:C2         | 3:C3  |       |       |       |       |       |              |        |        |
|                      | Electronic Circuit Design (Lab)                       | 9     |              |              |       | 1:P3  |       |       |       |       |              |        |        |
|                      | Electromagnetic Field Theory                          | 4     | 1:C2         | 2:C4         | 3:C4  |       |       |       |       |       |              |        |        |
| Semester 5           | Project Management                                    | 4     |              |              |       |       |       | 1:C2  |       |       |              | 2:C4   | 3:A5   |
|                      | Instrumentation and Measurements                      | 4     | 1:C2<br>2:C3 |              | 3:C3  |       |       |       |       |       |              |        |        |

| Annex D - Batch 2K25 |                                           |            |       |       |              |       |       |              |       |       |       |        |        |
|----------------------|-------------------------------------------|------------|-------|-------|--------------|-------|-------|--------------|-------|-------|-------|--------|--------|
| Semester             | Subject                                   | SDGs       | PLO-1 | PLO-2 | PLO-3        | PLO-4 | PLO-5 | PLO-6        | PLO-7 | PLO-8 | PLO-9 | PLO-10 | PLO-11 |
|                      | Instrumentation and Measurements (Lab)    | 4          |       |       |              |       | 1:P3  |              |       |       |       |        |        |
|                      | Microprocessor and Interfacing            | 4          |       | 1:C2  | 2:C3         |       |       |              |       |       |       |        |        |
|                      | Microprocessor and Interfacing (Lab)      | 4          |       |       |              |       | 1:P3  |              |       |       |       |        |        |
|                      | Communication Systems                     | 4          |       |       |              |       |       | 1:C2         |       |       | 2:C3  |        |        |
|                      | Communication Systems (Lab)               | 4          |       |       |              |       | 1:P3  |              |       |       |       |        |        |
|                      | Control System                            | 4          | 1:C2  | 2:C4  |              |       |       | 3:C6         | 4:C5  |       |       |        |        |
|                      | Control System (Lab)                      | 4          | 1:P4  | 2:P5  | 3:P6         |       |       |              |       |       |       |        |        |
|                      | Fehm-e-Quran-I                            | 4,16       |       |       |              |       |       | 1:C2         | 2:C2  |       |       |        | 3:C3   |
|                      | Philosophy-I (Alternative)                | 4,12,16    |       |       |              |       |       | 1:C2         | 2:C5  |       |       |        | 3:C3   |
| Semester 6           | Expository Writing                        | 4          |       |       |              |       |       |              |       |       | 1:C3  | 2:C4   | 3:C5   |
|                      | Computer Communication and Networks       | 4          |       |       | 1:C2         | 2:C4  |       |              |       | 3:C5  |       |        |        |
|                      | Computer Communication and Networks (Lab) | 4          |       |       |              |       | 1:P4  |              |       |       |       |        |        |
|                      | Power Electronics                         | 4,7        | 1:C2  | 2:C4  | 3:C6         | 4:C5  |       |              |       |       |       |        |        |
|                      | Power Electronics (Lab)                   | 4,7        | 1:P4  | 2:P5  | 3:P6         |       |       |              |       |       |       |        |        |
|                      | Electrical Machines                       | 4          | 1:C2  | 2:C2  |              | 3:C4  |       |              |       |       |       |        |        |
|                      | Electrical Machines (Lab)                 | 4          |       |       |              |       | 1:P3  |              |       |       |       |        |        |
|                      | Digital Signal Processing                 | 4          |       |       |              |       |       | 1:C2         |       |       | 2:C3  |        | 3:C4   |
|                      | Digital Signal Processing (Lab)           | 4          |       |       |              |       | 1:P3  |              |       |       |       |        |        |
|                      | Fehm-e-Quran-II                           | 4,16       |       |       |              |       |       | 1:C2<br>2:C4 | 3:C3  |       |       |        | 4:C5   |
|                      | Philosophy-II (Alternative)               | 4,12,16    |       | 1:C4  |              |       |       | 2:C3         |       | 3:C5  |       |        |        |
| Semester 7           | Renewable Energy Systems                  | 7,11<br>13 |       |       |              |       |       | 1:C3         |       |       | 2:C4  |        | 3:C5   |
|                      | Artificial Intelligence                   | 9,17       |       | 1:C2  | 2:C3         | 3:C4  |       |              |       |       |       |        |        |
|                      | Civics and Community Engagement           | 3          |       |       |              |       |       |              | 2:C4  | 1:C3  |       |        | 3:C4   |
|                      | Robotic Engineering                       | 8,9        |       |       |              |       |       | 1:C2         |       |       | 2:C4  |        |        |
|                      | Robotic Engineering (Lab)                 | 8,9        |       |       |              |       | 1:P4  |              |       |       |       |        |        |
|                      | Embedded Systems                          | 9,11       |       |       | 1:C2         | 2:C4  |       |              |       |       |       |        |        |
|                      | Embedded Systems (Lab)                    | 9,11       |       |       |              | 1:P4  |       |              |       |       |       |        |        |
|                      | FYP-I                                     |            | 1:C2  | 2:C4  | 4:P7         | 3:C6  | 3:C6  | 7:A4         | 5:A5  | 5:A5  | 5:A5  | 5:A5   |        |
| Semester 8           | Entrepreneurship                          | 1,2        |       |       |              |       |       | 3:A3         |       |       |       | 2:A4   | 1:C5   |
|                      | FPGA-Based Digital System Design          | 8,9        |       | 3:C3  | 1:C2<br>2:C5 |       |       |              |       |       |       |        |        |
|                      | FPGA-Based Digital System Design (Lab)    | 8,9        |       |       |              |       |       |              |       | 1:P3  |       |        |        |
|                      | Industrial Electronics                    | 8,9        | 1:C2  | 2:C5  |              | 4:C5  |       | 3:C6         |       |       |       |        |        |
|                      | Industrial Electronics (Lab)              | 8,9        | 1:P4  | 2:P5  | 3:P6         |       |       |              |       |       |       |        |        |
|                      | FYP-II(0+4)                               |            |       | 2:C4  | 4:P7         | 3:C6  | 3:C6  |              | 5:A5  | 5:A5  | 5:A5  | 5:A5   | 6:C6   |
| Total Number of PLOs |                                           |            | 25    | 25    | 18           | 15    | 13    | 14           | 9     | 10    | 11    | 6      | 12     |

## **First Year - First Semester**



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                                |
|----------------------------|--------------------------------|
| <b>Subject Name</b>        | <b>: Functional English</b>    |
| <b>Credit Hours</b>        | <b>: 3+0=3</b>                 |
| <b>Course Code</b>         | <b>: Theory (HUM25-110)</b>    |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>            |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                   |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48</b>                 |
| <b>Marks</b>               | <b>: Theory (100)</b>          |
| <b>Instructor Name</b>     | <b>: Mr. Israr Ahmed Khoso</b> |

### DESCRIPTION

Functional English focuses on developing practical language skills for effective communication in academic, professional, and everyday contexts. It emphasizes listening, speaking, reading, and writing to help students use English accurately and confidently in real-life situations.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                    |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality Education | 4.4: Substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship. |
|                          | 4.6: Ensure that all youth and a substantial proportion of adults achieve literacy and numeracy.                                                                                   |
|                          | 4.7: Ensure that learners acquire the knowledge and skills needed to promote sustainable development, global citizenship, and appreciation of cultural diversity.                  |

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                                     | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Contribute</b> to enhanced written and spoken English, including effective use of grammar and sentence structure.                                                            | Affective | A2             | 8   | 40    |
|               | 2   | <b>Express</b> information, ideas, and opinions effectively in both written and spoken English.                                                                                 | Affective | A3             | 9   | 30    |
|               | 3   | <b>Acknowledge</b> intercultural variations in the use of the English language and adapt communication style and content appropriately to diverse cultural and social contexts. | Affective | A1             | 11  | 30    |

## **COURSE OUTLINE (THEORY)**

Vocabulary building (contextual usage, synonyms, antonyms and idiomatic expressions). Communicative grammar (subject–verb agreement, verb tenses, fragments, run-ons, modifiers, articles, word classes, etc.) Word formation (affixation, compounding, clipping, back formation, etc.) Sentence structure (simple, compound, complex and compound-complex) Sound production and pronunciation, Understanding purpose, audience and context. Contextual interpretation (tones, biases, stereotypes, assumptions, inferences, etc.). Reading strategies (skimming, scanning, SQ4R, critical reading, etc.). Active listening (overcoming listening barriers, focused listening, etc.).

Principles of communication (clarity, coherence, conciseness, completeness, correctness, etc.). Structuring documents (introduction, body, conclusion and formatting). Inclusivity in communication (gender-neutral language, stereotypes, cross-cultural communication, etc.). Public speaking (overcoming stage fright, voice modulation and body language). Presentation skills (organization of content, visual aids and engaging the audience). Informal communication (small talk, networking and conversational skills). Professional writing (business e-mails, memos, reports, formal letters, etc.).

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] B. S. Azar and S. A. Hagen, Understanding and Using English Grammar, latest ed.
- [2] R. Murphy, English Grammar in Use, latest ed.
- [3] J. Straus, The Blue Book of Grammar and Punctuation, latest ed.
- [4] T. Hutchinson and A. Waters, English for Specific Purposes: A Learning-Centered Approach.
- [5] C. Downes, Cambridge English for Job-hunting.
- [6] M. Swan, Practical English Usage, latest ed.
- [7] M. James and A. P. Merickel, Reading Literature and Writing Argument.



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|                            |                                           |
|----------------------------|-------------------------------------------|
| <b>Subject Name</b>        | <b>: Calculus and Analytical Geometry</b> |
| <b>Credit Hours</b>        | <b>: 3+0=3</b>                            |
| <b>Course Code</b>         | <b>: Theory (NS25-111)</b>                |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>                       |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                              |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48</b>                            |
| <b>Marks</b>               | <b>: Theory (100)</b>                     |
| <b>Instructor Name</b>     | <b>: Mr. Rahat Ali Langha</b>             |

### **DESCRIPTION**

Calculus is used in various fields, including physics, engineering, economics, and computer science, to model and solve problems involving motion, optimization, and rates of change.

### **Mapping of SDGs**

|                          |                                                                                                                                                   |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.3: .... ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university. |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                  | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Define</b> key concepts of single-variable calculus, differential calculus, integral calculus, multivariable calculus, and analytical geometry.  | Cognitive     | C1                    | 1          | 32           |
|               | 2          | <b>Explain</b> limits, derivatives, integrals, multivariable functions, and coordinate-geometry principles used in engineering analysis.            | Cognitive     | C2                    | 2          | 32           |
|               | 3          | <b>Apply</b> calculus and analytical-geometry techniques to solve engineering problems involving rates of change, optimization, areas, and volumes. | Cognitive     | C3                    | 2          | 36           |

### **COURSE OUTLINE (THEORY):**

Review of vectors, scalars and vector products, Three-dimensional coordinate system and equation of straight line and plane. Review of functions and graphs, Limits & Continuity, Techniques of Finding Limits. Limits of Sine and Cosine and Exponential Functions

Differentiation: Introduction to Derivatives, Examples of Derivatives, Derivative as Rate of Change Derivative's Rules, Implicit Differentiation, Higher order derivative, Leibnitz, Theorem Applications of Derivatives, Monotonic functions, Optimization problems, Relative, Absolute extrema, First and second derivative tests, Point inflection, Concavity, Curvature, Indeterminate Forms and L' Hospital rule, Differentials. Integrals and Properties of Integrals Techniques of Integration, Integration by Parts Definite Integrals, Integration of Trigonometric, Exponential and Inverse Functions Integration by Partial Fractions Reduction Rules. Area under the curve Area between curves Solids of Revolution Volume of Solids of revolution by disk washer. Cylindrical shell & Cross Section Methods Center of Pressure and Depth of Center of Pressure Center of mass, Arc length improper. Improper Integral, Integrals and Singularities, Convergence of improper integrals Sequence and Infinite Series, Convergence and Divergence of sequences and series positive-term series, Integral Test. Alternating series, Absolute and Conditional Convergence Power and Taylor Series: Power series Maclaurin and Taylor Series and its Applications

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] G. B. Thomas, Jr., M. D. Weir, and J. R. Hass, Thomas' Calculus, latest ed.
- [2] E. W. Swokowski, M. Olinick, and D. Pence, Calculus, latest ed.
- [3] R. T. Smith and R. B. Minton, Calculus, latest ed.
- [4] J. Stewart, Calculus: Early Transcendentals, latest ed.





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|                            |                                                                    |
|----------------------------|--------------------------------------------------------------------|
| <b>Subject Name</b>        | <b>: Electronic Engineering Drawing<br/>and Workshop Practices</b> |
| <b>Credit Hours</b>        | <b>: 0+1=1</b>                                                     |
| <b>Course Code</b>         | <b>: Practical (EE25-112)</b>                                      |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                               |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                                       |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/16</b>                                                     |
| <b>Marks</b>               | <b>: Practical (50)</b>                                            |
| <b>Instructor Name</b>     | <b>: Engr. Abdul Manan</b>                                         |

### DESCRIPTION

This Lab course includes the basic understanding about the electronics component used for electronics circuit design such as resistors, capacitor, inductors, transformers and also learn about the computer aided engineering drawing tool for the sketching the drawing.

#### **Mapping of SDGs**

|                            |                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation | 9.5: ..... encouraging innovation and substantially increasing the number of research and development workers..... |
|----------------------------|--------------------------------------------------------------------------------------------------------------------|

### LABORTORY LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|                  | <b>CLO</b> | <b>Description</b>                                                                                                         | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|------------------|------------|----------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Practical</b> | 1          | <b>Identify</b> electronic components, workshop tools, drawing instruments, and applicable safety procedures.              | Psychomotor   | P1                    | 1          | 15           |
|                  | 2          | <b>Demonstrate</b> the correct use of workshop tools and assemble basic electrical and electronic circuits under guidance. | Psychomotor   | P2                    | 5          | 35           |

### COURSE OUTLINE (PRACTICAL):

Introduction to technical facilities in a workshop including mechanical and electrical equipment. Concepts in electrical safety, safety regulations, earthing concepts, electric shocks and treatment. Use of tools used by electricians, wiring regulations, types of cables and electrical accessories including switches, plugs, circuit breakers and fuses etc. UPS/ invertors and battery charging Industrial, domestic and auto wiring. Symbols for electrical wiring

schematics. Wiring schemes of two-way, three-way and ringing circuits. Electric soldering/ de-soldering. PCB design, transferring a circuit to PCB, etching, drilling and soldering components on PCB.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] U. Rathore and N. K. Sharma, A Textbook of Electrical Workshop Practices, latest ed.
- [2] S. K. Choudhury, Elements of Workshop Technology, vol. 1, latest ed.
- [3] W. A. J. Chapman, Workshop Technology, Parts I–III, latest ed.



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|                            |                                        |
|----------------------------|----------------------------------------|
| <b>Subject Name</b>        | <b>: Linear Circuit Analysis</b>       |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                         |
| <b>Course Code</b>         | <b>: Theory (EE25-113)</b>             |
|                            | <b>: Practical (EE25-114)</b>          |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                   |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                           |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                      |
| <b>Marks</b>               | <b>: Theory (100)</b>                  |
|                            | <b>: Practical (50)</b>                |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Mudasir Ahmed Memon</b> |

### DESCRIPTION

Linear Circuit Analysis introduces the fundamental principles and techniques for analyzing electric circuits. The course covers Ohm's Law, Kirchhoff's laws, network theorems, and methods such as mesh and nodal analysis to understand the behavior of linear electrical networks under DC and AC conditions.

### **Mapping of SDGs**

|                            |                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation | 9.4: greater adoption of clean and environmentally sound technologies and industrial processes..... |
|----------------------------|-----------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                                                                                                                | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> basic concepts and terms, along with related theorems, laws, and methods used in the analysis of electric circuits.                                                                                                                | Cognitive     | C2                    | 1          | 50           |
|               | 2          | <b>Apply</b> circuit reduction techniques such as series and parallel combinations and source transformations, and use circuit-solving techniques such as mesh and nodal analysis, along with theorems, to analyze static and transient circuits. | Cognitive     | C3                    | 4          | 50           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                                         | Domain      | Taxonomy<br>-level | PLO | Marks |
|-----------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|-----|-------|
| Practical | 1   | <b>Practice</b> experiments in the laboratory in order to interpret experimental data under guidance and observe its conformance with analyzed results of circuits. | Psychomotor | P3                 | 8   | 50    |

## **COURSE OUTLINE (THEORY):**

Basic Electrical Concepts: Charge. Current. Voltage. Power, Voltage and Current sources  
Voltage and Current Laws: Ohm's Law', Kirchhoff's Current Law, Kirchhoff's, Voltage Law,  
Voltage Division in series Current Division in Parallel, Series and Parallel Sources  
Nodal and Mesh Analysis: Nodal Analysis and Super Node, Mesh Analysis and Super Mesh,  
Comparison between Nodal and Mesh Analysis Circuit Analysis Techniques, Linearity and  
Superposition, Source Transformation: Thevenin's and Norton's Theorem, Maximum Power  
Transfer, Delta-Wye, Transformation: Energy Storing Elements: The Inductor, The Capacitor,  
Physical construction and Mathematical Model First Order Circuits (RL and RC), Transient  
Response, Steady State Response

## **COURSE OUTLINE (PRACTICAL):**

Study of DC series circuits, parallel circuits, Kirchhoff's current and voltage laws, current  
divider theorem, voltage divider theorem, network theorems, simple RLC circuits, and  
simulation of basic electrical circuits using PSPICE. Lab activity will be followed by semester  
project.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] W. H. Hayt, Jr. and J. E. Kemmerly, Engineering Circuit Analysis, latest ed.
- [2] J. D. Irwin, Basic Engineering Circuit Analysis, latest ed.
- [3] S. Franco, Electric Circuits Fundamentals, latest ed.
- [4] R. L. Boylestad, Introductory Circuit Analysis, latest ed.



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**Subject Name** : Applications of ICT  
**Credit Hours** : 2+1=3  
**Course Code** : Theory (CS25-115)  
 : Practical (CS25-116)  
**Effective** : 2K25-BE(EE)  
**Pre-Requisites** : Nil  
**Weeks/Lectures/Labs** : 16/32/16  
**Marks** : Theory (50)  
 : Practical (50)  
**Instructor Name** : Dr. Asif Jamali

**DESCRIPTION:**

ICT, or Information and Communication Technology, encompasses the use of technology to manage, process, and communicate information, including computers, the internet, and other digital devices, playing a crucial role in various sectors.

**Mapping of SDGs**

|                          |                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: .... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**COURSE LEARNING OUTCOMESS**

Upon successful completion of the course, the student will be able to:

|        | CLO | Description                                                                                                                                                                                          | Domain    | Taxonomy level | PLO | Marks |
|--------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| Theory | 1   | <b>Define</b> the fundamental concepts, components, and scope of Information and Communication Technologies (ICT).                                                                                   | Cognitive | C1             | 1   | 20    |
|        | 2   | <b>Identify</b> uses of various ICT platforms and tools for different purposes.                                                                                                                      | Cognitive | C2             | 1   | 5     |
|        | 3   | <b>Apply</b> ICT platforms and tools to address basic needs in daily, academic, and professional domains, and understand the ethical and legal considerations in the use of ICT platforms and tools. | Cognitive | C3             | 3   | 25    |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | <b>CLO</b> | <b>Description</b>                                                                                                                                      | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Practical</b> | 1          | <b>Perform</b> common ICT tasks using office applications, cloud storage, online communication tools, and learning-management platforms under guidance. | Psychomotor   | P3                    | 5          | 50           |

## **COURSE OUTLINE (THEORY):**

Introduction to Information and Communication Technologies: Components of Information and Communication Technologies (basics of hardware, software, ICT platforms, networks, local and cloud data storage etc.). Scope of Information and Communication Technologies (use of ICT in education, business, governance, healthcare, digital media and entertainment, etc.). Emerging technologies and future trends. Basic ICT Productivity Tools: Effective use of popular search engines (e.g., Google, Bing, etc.) to explore World Wide Web. Formal communication tools and etiquettes (Gmail, Microsoft Outlook, etc.). Microsoft Office Suites (Word, Excel, PowerPoint). Google Workspace (Google Docs, Sheets, Slides). Dropbox (Cloud storage and file sharing). Google Drive (Cloud storage with Google Docs integration) and Microsoft OneDrive (Cloud storage with Microsoft Office integration). Evernote (Note-taking and organization applications) and OneNote (Microsoft's digital notebook for capturing and organizing ideas). Video conferencing (Google Meet, Microsoft Teams, Zoom. etc.). Social media applications (LinkedIn, Facebook, Instagram, etc.). ICT in Education: Working with learning management systems (Moodle. Canvas. Google Classrooms, Sources of online education courses (Coursera. edX, Udemy. Khan Academy, etc.). Interactive multimedia and virtual classrooms. ICT in Health and Well-being: Health and fitness tracking devices and applications (Google Fit, Samsung Health, Apple Health, Xiaomi Mi Band, RunKeeper, etc.). Telemedicine and online health consultations (OLADOC. Schact Kahani. Marham. ICT in Personal Finance and Shopping: Online banking and financial management tools (Jazz Cash. Easypaisa, Zong Pay Max. 1LINK and MNET, Keenu Wallet, etc.). E-commerce platforms (Daraz.pk, Telemart. Shophive, etc.) Digital Citizenship and Online Etiquette: Digital identity and online reputation. Netiquette and respectful online communication. Cyberbullying and online harassment. Ethical Considerations in Use of ICT Platforms and Tools: Intellectual property and copyright issues. Ensuring originality in content creation by avoiding plagiarism and unauthorized use of information sources. Content accuracy and integrity (ensuring that the content shared through ICT platforms is free from misinformation, fake news, and manipulation).

## **COURSE OUTLINE (PRACTICAL):**

Guided tutorials and exercises to ensure that students are proficient in commonly used software applications such as word processing software (e.g. Microsoft Word), presentation software (e.g. Microsoft PowerPoint), spreadsheet software (e.g. Microsoft Excel) among such other tools students may be assigned practical tasks that require them to create documents, presentations and spreadsheets etc. Assigning of tasks that involve creating, managing, and organizing files and folders on both local and cloud storage systems., students will practice file

naming conventions, creating directories, and using cloud storage solutions (e.g., Google Drive, OneDrive). The use of online learning management systems (LMS) where students can access course materials, submit assignments, participate in discussion forums, and take quizzes or tests. This will provide students with the practical experience with online platforms commonly used in education and the workplace.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] G. B. Shelly, M. Vermaat, S. Cashman, and J. Freund, Discovering Computers, latest ed.
- [2] S. Gaskin, A. Vargas, and N. McLellan, GO! with Microsoft Office, latest ed.
- [3] R. Grauer and M. Poatsy, Exploring Microsoft Office, latest ed.



**Department of Electronic Engineering**  
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|                     |                                               |
|---------------------|-----------------------------------------------|
| Subject Name        | : Applied Physics                             |
| Credit Hours        | : 2+1=3                                       |
| Course Code         | : Theory (NS25-117)<br>: Practical (NS25-118) |
| Effective           | : 2K25-BE(EE)                                 |
| Pre-Requisites      | : Nil                                         |
| Weeks/Lectures/Labs | : 16/32/16                                    |
| Marks               | : Theory (50)<br>: Practical (50)             |
| Instructor Name     | : Engr. Kundan Kumar                          |

### **DESCRIPTION:**

This course includes the basic concepts of electricity, magnetism, electromagnetism, waves and oscillation, electronics and mechanics and their applications.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.7: .... ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles. |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                                                 | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Recall</b> the fundamental theories of mechanics, electricity, magnetism, electromagnetism, waves, oscillations, and electronics.                                                        | Cognitive | C1             | 1   | 15    |
|               | 2   | <b>Define</b> and <b>explain</b> basic concepts of electric charge, fundamental laws of physics, electricity, and magnetism, and identify their applications in various engineering fields. | Cognitive | C2             | 1   | 20    |
|               | 3   | <b>Formulate</b> and <b>solve</b> basic equations and problems related to electromagnetism and magnetism.                                                                                   | Cognitive | C3             | 2   | 15    |



## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                        | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|----------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | Draw the circuit diagram on the breadboard and practice on the trainer kits under proper guidance. | Psychomotor | P3             | 2   | 50    |

## **COURSE OUTLINE (THEORY):**

Vectors: Review of vectors. Ordinary Differentiation of Vector, Gradient of Scaler field. Divergence and Curl of Vector Field, Line and Surface Integrals with applications. Mechanics: Newton Laws and their Applications (Simple Accelerometer, Banked Curve and Rotor), Frictional Forces and determination of Co-efficient of Friction, Work-Energy Theorem, applications of law of Conservation of Energy. Angular Momentum. Centre of Mass of two-particles. Many-particles and Solid Object, Rotational Inertia of Solid Bodies. Electrostatics And Magnetism: Electric field due to Discrete and Continuous Charge Distribution, Electrostatic Potential of discrete and Continuous charges, Applications of Gauss's Law, Lorentz Force and Hall effect. Ampere's Law, Magnetic Field due to Circular Current Loop and Solenoid. Magnetic dipole. Atomic and Nuclear Magnetism. Magnetization. Magnetic Materials. Semiconductor Physics: Energy levels in a Semiconductor, Hole concept. Intrinsic and Extrinsic regions. Law of Mass Action. P-N junction. Transistors. Waves And Oscillations: Simple Harmonic Oscillator. Damped Harmonic Oscillation. Forced Oscillation and Resonance. Types of Waves and Superposition Principle. Wave Speed on a stretched string. Wave equation. Energy & Power of a Wave.

Optics And Lasers: Huygens Principle, Two-slit interference, Single-Slit Diffraction. Resolving power of Optical Instruments. Principles for Laser action. Types of Lasers. Applications of Laser. Modern Physics: Planck's explanations of Black Body Radiation Photoelectric Effect. Compton Effect. de Broglie Hypothesis. Electron Microscope. Atomic structure. X-rays and Moseley's Law. Atomic Nucleus and Properties of Nucleus. Radioactive Decay and Radioactive Dating. Radiation Detection Instruments, Nuclear Reactions

## **COURSE OUTLINE (PRACTICAL):**

Safety Rules, Ohm's law, Resistors in series and parallel capacitance and dielectrics, current and resistance, magnetic fields, sources of magnetic field, Faraday's law, inductance, direct current circuits, alternating current circuits, diode characteristics, Multisim overview, Half wave and full wave rectifier DC power supply.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] D. Halliday, R. Resnick, and J. Krane, Physics, latest ed.
- [2] H. D. Young and R. A. Freedman, University Physics, latest ed.
- [3] R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers, latest ed.

## **First Year - Second Semester**



**Department of Electronic Engineering  
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|                     |                                                    |
|---------------------|----------------------------------------------------|
| Subject Name        | : <b>Linear Algebra and Differential Equations</b> |
| Credit Hours        | : 3+0=3                                            |
| Course Code         | : Theory (NS25-120)                                |
| Effective           | : 2K25-BE(E)                                       |
| Pre-Requisites      | : Nil                                              |
| Weeks/Lectures/Labs | : 16/48                                            |
| Marks               | : Theory (100)                                     |
| Instructor Name     | : Engr. Kundan Kumar                               |

### **DESCRIPTION:**

This course introduces fundamental concepts of linear algebra and differential equations essential for solving engineering and scientific problems. It covers vectors, matrices, systems of linear equations, and linear transformations, along with first- and higher-order differential equations, their solutions, and applications in real-world systems.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                 | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Describe</b> matrix operations, including inverses, factorizations, and determinants.    | Cognitive | C2             | 1   | 30    |
|               | 2   | <b>Apply</b> techniques of linear algebra and optimization to solve real-life problems.     | Cognitive | C3             | 2   | 40    |
|               | 3   | <b>Apply</b> different analytical methods to solve various types of differential equations. | Cognitive | C3             | 2   | 30    |

### **COURSE OUTLINE (THEORY):**

System of Linear equations and Applications with real-world civil engineering case studies. The Eigenvalues and Eigenvectors explore the concepts and applications of linear algebra in constructing curves and surfaces. Linear Programming introduces optimization principles.

Basic concepts and Modelling cover linear/ non-linear differential equations and initial/ boundary value problems. Analytical methods for first-order ODEs, separable variable, homogeneous, exact, and linear equations are discussed, alongside applications such as mixing problems and temperature prediction. The subsequent section investigates the analytical methods for second order ODEs covering homogeneous and non-homogeneous, Cauchy-Euler equations, with practical applications in earthquake modeling and bridge collapse scenarios.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] B. Kolman and D. R. Hill, Introductory Linear Algebra, latest ed.
- [2] E. Kreyszig, Advanced Engineering Mathematics, latest ed. John Wiley & Sons.
- [3] J. Polking, A. Boggess, and D. Arnold, Differential Equations, latest ed. Prentice Hall.
- [4] E. Kreyszig, Advanced Engineering Mathematics, latest ed. John Wiley & Sons.
- [5] D. G. Zill and M. R. Cullen, Differential Equations with Boundary Value Problems, latest ed. Brooks/Cole.
- [6] D. G. Zill, A First Course in Differential Equations with Modeling Applications, latest ed. Brooks/Cole.
- [7] E. A. Bender, An Introduction to Mathematical Modeling, latest ed. Wiley.



**Department of Electronic Engineering**  
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|                        |                               |
|------------------------|-------------------------------|
| <b>Subject Name</b>    | <b>: Discrete Mathematics</b> |
| <b>Credit Hours</b>    | <b>: 3+0=3</b>                |
| <b>Course Code</b>     | <b>: Theory (NS25-121)</b>    |
| <b>Effective</b>       | <b>: 2K25-BE(E)</b>           |
| <b>Pre-Requisites</b>  | <b>: Nil</b>                  |
| <b>Weeks/Lecture</b>   | <b>: 16/48</b>                |
| <b>Marks</b>           | <b>: Theory (100)</b>         |
| <b>Instructor Name</b> | <b>: Engr. Umair Ali Abro</b> |

**DESCRIPTION:**

Discrete Mathematics deals with mathematical structures that are fundamentally discrete rather than continuous. It includes topics such as logic, set theory, combinatorics, graph theory, and algorithms, providing essential tools for computer science, data structures, and digital system design.

**Mapping of SDGs**

|                          |                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                           | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|----------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Understand</b> mathematical reasoning to comprehend and construct mathematical arguments. | Cognitive     | C2                    | 1          | 50           |
|               | 2          | <b>Solve</b> counting problems using combinatorial analysis.                                 | Cognitive     | C3                    | 2          | 50           |

**COURSE OUTLINE (THEORY):**

Number Theory. Introduction to Sets. Set operations and properties, Venn diagrams. Sequences and Strings. Relations. Functions. Propositional logic. Conditional propositions and logical equivalence. Proofs. Rules of inference. Mathematical induction and recursion. Matrices. Revision Boolean Algebra Algorithms, integers and recursion. Counting Techniques Introducing graphs and trees. Algebraic structures. Languages and Grammars. Finite state machines.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] K. H. Rosen, Discrete Mathematics and Its Applications, latest ed. McGraw Hill.
- [2] R. Johnsonbaugh, Discrete Mathematics, latest ed. Pearson Education Asia.
- [3] S. S. Epp, Discrete Mathematics with Applications, latest ed. Cengage Learning.
- [4] R. P. Grimaldi, Discrete and Combinatorial Mathematics, latest ed. Pearson Education.



**Department of Electronic Engineering  
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|                        |                                                |
|------------------------|------------------------------------------------|
| <b>Subject Name</b>    | <b>: Communication and Presentation Skills</b> |
| <b>Credit Hours</b>    | <b>: 2+0=2</b>                                 |
| <b>Course Code</b>     | <b>: Theory (HUM25-122)</b>                    |
| <b>Effective</b>       | <b>: 2K25-BE(EE)</b>                           |
| <b>Pre-Requisites</b>  | <b>: Nil</b>                                   |
| <b>Office Hours</b>    | <b>: 2-hours/ week</b>                         |
| <b>Marks</b>           | <b>: Theory (50)</b>                           |
| <b>Instructor Name</b> | <b>: Mr. Israr Ahmed Khoso</b>                 |

### DESCRIPTION

This course focuses on developing effective verbal, non-verbal, and written communication skills essential for academic and professional success. It emphasizes clarity, confidence, and organization in delivering presentations, participating in discussions, and preparing professional documents.

### **Mapping of SDGs**

|                                        |                                               |
|----------------------------------------|-----------------------------------------------|
| SDG 8: Decent work and economic growth | 8.3: decent job creation, entrepreneurship... |
|----------------------------------------|-----------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                             | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Demonstrate</b> effective use of intermediate to advanced level English.                                             | Affective | A2             | 9   | 25    |
|               | 2   | <b>Acknowledge</b> the impact of different communication styles and presentation skills on interpersonal relationships. | Affective | A1             | 11  | 25    |

### COURSE OUTLINE (THEORY):

Writing Skills: Vocabulary Building, Writing Skills: Essays and Letters, Common Writing Errors, Purposeful Writing. Reading Skills: Skimming and Scanning, Critical Reading, Reading for Understanding, Techniques and strategies to develop sound vocabulary. Listening Skills, Introduction to Communication, Process, Seven Cs of Communication. Types of Listening: Listening for Comprehension, Speaking Skills, Verbal and Non-Verbal Communication, Basics of Presentation Skills. Presentation Strategies and public speaking

skills. Use of Audio-Visual Aids, Basics of Group Communication, Listening Skills  
Communicate effectively in job interviews

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] Anchor in English-II (Lessons 1–5), latest ed. SPELT Publications.
- [2] C. Fry, Summary Writing (Book I), latest ed. Oxford University Press.
- [3] J. Langlan, College Essays, latest ed.
- [4] Barron's TOEFL iBT, latest ed.
- [5] S. Marshal and C. Muralikrishna, Communication Skills for Engineers, latest ed.





**Department of Electronic Engineering  
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|                        |                                |
|------------------------|--------------------------------|
| <b>Subject Name</b>    | <b>: Pakistan Studies</b>      |
| <b>Credit Hours</b>    | <b>: 2+0=2</b>                 |
| <b>Course Code</b>     | <b>: Theory (HUM25-123)</b>    |
| <b>Effective</b>       | <b>: 2K25-BE(EE)</b>           |
| <b>Pre-Requisites</b>  | <b>: Nil</b>                   |
| <b>Weeks/Lecture</b>   | <b>: 16/32</b>                 |
| <b>Marks</b>           | <b>: Theory (50)</b>           |
| <b>Instructor Name</b> | <b>: Mr. Bisharat Lanjwani</b> |

### **DESCRIPTION**

Pakistan Studies explores the historical, cultural, political, and social development of Pakistan. It covers the country's creation, key historical events, and the challenges faced in its nation-building process, along with an understanding of its geography, economy, and national identity.

### **Mapping of SDGs**

|                                                |                                                                                                                                                                       |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 5: Gender equality                         | 5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life. |
| SDG 16: Peace, Justice and Strong Institutions | 16.3: ..... rule of law at the national and international levels.....                                                                                                 |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                        | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Recall</b> the basic ideology of Pakistan with special reference to the contributions of the founding fathers of Pakistan.                             | Cognitive     | C1                    | 6          | 25           |
|               | 2          | <b>Justify</b> the guiding principles related to the rights and responsibilities of Pakistani citizens as enshrined in the Constitution of Pakistan 1973. | Cognitive     | C5                    | 7          | 25           |

### **COURSE OUTLINE (THEORY):**

Introduction to the Ideology of Pakistan: Definition and significance of ideology, Historical context of the creation of Pakistan (with emphasis on sociopolitical, religious, and cultural dynamics of British India between 1857 till 1947), Contributions of founding fathers of

Pakistan in the freedom movement including but not limited to Allama Muhammad Iqbal, Muhammad Ali Jinnah., etc, Contributions of women and students in the freedom movement for separate homeland for Muslims of British India. Two-Nation Theory: Evolution of the Two-Nation Theory (Urdu-Hindi controversy. Partition of Bengal. Simla Deputation 1906. Allama Iqbal's Presidential Address 1930. Congress Ministries 1937. Lahore Resolution 1940), Role of communalism and religious differences. Introduction to the Constitution of Pakistan: Definition and importance of a constitution, Ideological factors that shaped the

Constitution(s) of Pakistan (Objectives Resolution 1949), Overview of constitutional developments in Pakistan. Constitution and State Structure: Structure of Government (executive, legislature, and judiciary), Distribution of powers between federal and provincial governments, 18th Amendment and its impact on federalism. Fundamental Rights, Principles of Policy and Responsibilities: Overview of fundamental rights guaranteed to citizens by the Constitution of Pakistan 1973 (Articles 8-28), Overview of Principles of Policy (Articles 29-40), Responsibilities of the Pakistani citizens (Article 5). Constitutional Amendments: Procedures for amending the Constitution, Notable constitutional amendments and their implications

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] S. J. Burki, State and Society in Pakistan. London, U.K.: Macmillan Press.
- [2] S. A. Zaidi, Issues in Pakistan's Economy. Karachi, Pakistan: Oxford University Press.
- [3] S. M. Burke and L. Ziring, Pakistan's Foreign Policy: An Historical Analysis. Karachi, Pakistan: Oxford University Press.
- [4] S. Mahmood, Pakistan: Political Roots and Development. Lahore, Pakistan.
- [5] S. P. Cohen, The Idea of Pakistan, latest ed.
- [6] J. Iqbal, Ideology of Pakistan, latest ed.
- [7] I. H. Qureshi, The Struggle for Pakistan, latest ed.
- [8] K. B. Sayeed, Pakistan: The Formative Phase, latest ed.
- [9] S. Mahmood, Pakistan: Political Roots and Development, latest ed.
- [10] S. al-Mujahid, Ideology of Pakistan, latest ed.
- [11] A. Jalal, The Struggle for Pakistan: A Muslim Homeland and Global Politics, latest ed.
- [12] A. S. Ahmed, Jinnah, Pakistan and Islamic Identity: The Search for Saladin, latest ed.
- [13] K. K. Aziz, The Making of Pakistan: A Study in Nationalism, latest ed.
- [14] I. Talbot, Pakistan: A New History, latest ed.
- [15] L. Ziring, Pakistan in the Twentieth Century: A Political History, latest ed.
- [16] The Constitution of Pakistan (1973), official text.



**Department of Electronic Engineering  
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|                            |                                                     |
|----------------------------|-----------------------------------------------------|
| <b>Subject Name</b>        | <b>: Computer Programming</b>                       |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                      |
| <b>Course Code</b>         | <b>: Theory (CS25-124)<br/>Practical (CS25-125)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                        |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                   |
| <b>Marks</b>               | <b>: Theory (100)<br/>Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Engr. Safiullah</b>                            |

**DESCRIPTION:**

Computer Programming introduces students to the fundamentals of writing code to solve problems using programming languages. The course covers key concepts such as algorithms, data structures, control structures, and debugging, focusing on building problem-solving skills through practical coding exercises.

**Mapping of SDGs**

|                          |                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                  | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|---------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> the principles of the object-oriented programming paradigm, class libraries, and exception handling. | Cognitive     | C2                    | 1          | 40           |
|               | 2          | <b>Use</b> class instances and their relationships to develop object-oriented solutions.                            | Cognitive     | C3                    | 3          | 60           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                                                                     | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Implement</b> problem solving techniques, control structures, data handling, memory management, algorithms, and advanced programming structures (trees, graphs) using Python with precision. | Psychomotor | P3             | 5   | 50    |

## **COURSE OUTLINE (THEORY)**

Introduction to problem solving, Brief review of Von-Neumann architecture. Introduction to programming. Role of compiler and linker. Introduction to algorithms, Basic data types and variables, Input/output constructs, Arithmetic, comparison and logical operators, Conditional statements and execution flow for conditional statements, repetitive statements and execution flow for repetitive statements, Lists and their memory organization, multi-dimensional lists. Introduction to modular programming, function definition and calling, stack rolling and unrolling, string and string operations, arrays, pointers, references, static and dynamic memory allocation. File I/O operations. Recursion and Searching Algorithms, Sorting Algorithms, Graphs and Graph Algorithms, Trees and Binary Search Trees, Exception Handling and Debugging, Programming language: C/C++/ Java/ Python.

## **COURSE OUTLINE (PRACTICAL)**

Implementation using simple programs for basic arrays, single-dimensional arrays, two-dimensional arrays, algorithm implementations, implementation of simple data structures like array, implementation of stacks, queues and priority queues, linked list, doubly linked list, circular linked list, tree searching algorithms implementation of hash algorithms, simple sorting techniques including bubble sorting and selection sorting, advanced searching schemes including binary searching and quick searching..

## **RECOMMENDED/REFERENCE BOOKS**

- [1] T. Gaddis, Starting Out with Python, latest ed.
- [2] T. Gaddis, Starting Out with Programming Logic and Design, latest ed.
- [3] B. W. Kernighan and D. M. Ritchie, The C Programming Language, latest ed.
- [4] R. Lafore, Object-Oriented Programming in C++, latest ed.
- [5] J. V. Guttag, Introduction to Computation and Programming Using Python: With Application to Understanding Data, latest ed.
- [6] W. Punch and R. Enbody, The Practice of Computing Using Python, latest ed.



**Department of Electronic Engineering  
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|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| <b>Subject Name</b>        | <b>: Electronic Devices and Circuits</b>              |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                        |
| <b>Course Code</b>         | <b>: Theory (EE25-126)<br/>: Practical (EE25-127)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                  |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                          |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                     |
| <b>Marks</b>               | <b>: Theory (100)<br/>: Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Mudasir Ahmed Memon</b>                |

### **DESCRIPTION**

This course introduces the fundamental principles of electronic devices such as diodes, transistors, and operational amplifiers. It focuses on the analysis and design of basic analog circuits, laying the foundation for advanced studies in electronics and circuit design.

### **Mapping of SDGs**

|                                                |                                                                                                           |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| SDG 9: Industry, Innovation and Infrastructure | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes..... |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                     | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> the basic construction, operation, and characteristics of semiconductor devices.                        | Cognitive     | C2                    | 1          | 50           |
|               | 2          | <b>Apply</b> acquired knowledge to analyze the DC and AC response of semiconductor device-based small-signal circuits. | Cognitive     | C3                    | 4          | 50           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                          | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | Assemble and operate semiconductor-device circuits under guidance, measure and record key quantities, and confirm the expected theoretical behavior. | Psychomotor | P3             | 8   | 50    |

## **COURSE OUTLINE (THEORY):**

Semiconductor Theory: Introduction to Semiconductors. Intrinsic and Extrinsic Semiconductors. Doping and energy levels. Diodes' junction/ Biased PN junction, V-I Characteristics, Load Line and dynamic resistance. Diode models. Reverse recovery time and temperature effects. Diode Equivalent Circuits Transitions, Recovery, Specification, Notations Testing of Diode Zener Diode, Light Emitting Diodes. Diode Applications, Load Line Analysis, Parallel and Series Configurations, Zener Diodes. Voltage-Multiplier Circuits, Half wave and Full wave rectifiers. Clippers and Clampers. Logic gates.

Bipolar Junction Transistors: Construction. Limits of Operation. Specification and characteristics. Testing, Casing and Terminal Identification of BJTs, Amplifying action and variation in current gain. Common Emitter. Common Collector and Common Base Configurations. Power Ratings' Biasing Circuits, Fixed Bias. Voltage Divider Bias and Emitter feedback Bias Circuits, DC load line and operating point, Biasing circuit design and stabilization, Miscellaneous Configurations, Transistor as a switch Small Signal Analysis Domain and BJT Modeling, Common Emitter Amplifier, Common Base Amplifier, Common Collector Amplifier, Amplifier Design and Loading effects, Two Port Systems and Cascaded Systems, Darlington and feedback Pair, Hybrid Equivalent Model and Hybrid  $\pi$  Model Field Effect Transistors' Construction and Operation, Transfer characteristics and parameters Biasing Circuits, Fixed Bias, Self-Bias and Voltage divider Bias Design of a bias circuit FET Small Signal Analysis JFE T Depletion MOSFET small-signal model Common source, common drain and common gate amplifiers, Loading effects and design of amplifier circuits.

## **COURSE OUTLINE (PRACTICAL):**

The emphasis is first on understanding the characteristics of basic circuits that use resistors, capacitors, diodes, bipolar junction transistors and field-effect transistors. The students then use this understanding to design and construct more complex circuits such as rectifiers, amplifiers and power supplies.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] T. F. Bogart Jr., Electronic Devices and Circuits, latest ed.
- [2] R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, latest ed.
- [3] T. L. Floyd, Electronic Devices, latest ed.

## **Second Year – Third Semester**





**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                          |
|----------------------------|------------------------------------------|
| <b>Subject Name</b>        | <b>: Complex Variables and Transform</b> |
| <b>Credit Hours</b>        | <b>: 3+0=3</b>                           |
| <b>Course Code</b>         | <b>: Theory (NS25-210)</b>               |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                     |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                             |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48</b>                           |
| <b>Marks</b>               | <b>: Theory (100)</b>                    |
| <b>Instructor Name</b>     | <b>: Dr. Shahnawaz Shah</b>              |

### DESCRIPTION

This subject explores the properties and behavior of complex numbers and functions of a complex variable, extending concepts from real analysis to the complex plane.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: .... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                               | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Identify</b> complex numbers, complex functions, and fundamental theorems of complex-valued functions.                 | Cognitive | C1             | 1   | 30    |
|               | 2   | <b>Understand</b> the concepts of calculus for complex-valued functions and the properties of various transforms.         | Cognitive | C2             | 1   | 30    |
|               | 3   | <b>Apply</b> computational and conceptual principles of various transforms to solve problems in engineering and sciences. | Cognitive | C3             | 2   | 40    |

### COURSE OUTLINE (THEORY):



Introduction to complex number systems, Arganda's diagram, modulus and argument of a complex number, polar form of a complex number, De Moivre's theorem and its applications, complex functions, analytical functions, harmonic and conjugate, harmonic functions, Cauchy-Riemann equations, line integrals, Green's theorem, Cauchy's theorem, Cauchy's integral formula, singularities, poles, residues, contour integration and applications; Laplace transform definition, Laplace transforms of elementary functions, properties of Laplace transform, periodic functions and their Laplace transforms, inverse Laplace transform and its properties, convolution theorem, inverse Laplace transform by integral and partial fraction methods, Heaviside expansion formula, solutions of ordinary differential equations by Laplace transform, applications of Laplace transforms; series solution of differential equations, validity of series solution, ordinary point, singular point, Forbenius method, indicial equation, Bessel's differential equation, its solution of first kind and recurrence formulae, Legendre differential equation and its solution, Rodrigues formula; Fourier transform definition, Fourier transforms of simple functions, magnitude and phase spectra, Fourier transform theorems, inverse Fourier transform, solutions of differential equations using Fourier transform.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] E. Kreyszig, Advanced Engineering Mathematics, latest ed. John Wiley & Sons.
- [2] W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, latest ed. Wiley.
- [3] D. G. Zill, Advanced Engineering Mathematics, latest ed. Jones & Bartlett Learning.
- [4] J. Stewart, Calculus: Early Transcendentals, latest ed. Cengage Learning.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                        |                                   |
|------------------------|-----------------------------------|
| <b>Subject Name</b>    | <b>: Engineering Management</b>   |
| <b>Credit Hours</b>    | <b>: 2+0=2</b>                    |
| <b>Course Code</b>     | <b>: Theory (SS25-211)</b>        |
| <b>Effective</b>       | <b>: 2K25-BE(E)</b>               |
| <b>Pre-Requisites</b>  | <b>: Nil</b>                      |
| <b>Weeks/Lecture</b>   | <b>: 16/32</b>                    |
| <b>Marks</b>           | <b>: Theory (50)</b>              |
| <b>Instructor Name</b> | <b>: Engr. Dr. Beenish Ansari</b> |

**DESCRIPTION:**

Engineering Management is an interdisciplinary field that combines technical engineering knowledge with business and leadership principles to optimize processes, projects, and organizations. This subject bridges the gap between engineering and management, preparing professionals to lead teams, manage resources, and drive innovation in technology-driven industries.

**Mapping of SDGs**

|                                                |                                                                                        |
|------------------------------------------------|----------------------------------------------------------------------------------------|
| SDG 8: Decent work and economic growth         | 8.3: decent job creation, entrepreneurship                                             |
| SDG 12: Responsible consumption and production | 12.2: ..... achieve the sustainable management and efficient use of natural resources. |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                     | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Describe</b> the fundamentals of industrial networks, product and process development, and modern business management practices.                    | Cognitive     | C2                    | 8          | 20           |
|               | 2          | <b>Recognize</b> the role of multidisciplinary, science-based knowledge in solving engineering management problems and fostering innovation.           | Affective     | A2                    | 9          | 10           |
|               | 3          | <b>Defend</b> a comprehensive business plan including market identification, technology marketing, financing, and appropriate distribution strategies. | Affective     | A5                    | 10         | 20           |

### **COURSE OUTLINE (THEORY):**

Industrial networks, Fundamentals of Product and Process development, Business Community and New Generations of Managers, Practical Skills Knowledge and Experience in Commercialization of New- Technological Inventions, Use of Multidisciplinary' Science Based Knowledge, Problem Solving. Teamwork and Outreach Activity. Major steps in proof of concept to intellectual property protection. Prototype development, Fabrication and assembly routes Materials procurement, Identification and creation of new markets, Development of business plan, Appropriate technology and marketing, Distribution and financing, Routes and strategies for specific technology under development.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] R. A. Burgelman, Strategic Management of Technology and Innovation, latest ed. McGraw Hill.
- [2] M. E. Porter, Competitive Advantage: Creating and Sustaining Superior Performance, latest ed. Free Press.
- [3] H. Chesbrough, Open Innovation: The New Imperative for Creating and Profiting from Technology, latest ed. Harvard Business School Press.
- [4] J. Tidd and J. Bessant, Managing Innovation: Integrating Technological, Market and Organizational Change, latest ed. Wiley.
- [5] K. B. Clark and S. C. Wheelwright, Managing New Product and Process Development, latest ed. Free Press.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                         |
|----------------------------|-----------------------------------------|
| <b>Subject Name</b>        | <b>: Occupational Health and Safety</b> |
| <b>Credit Hours</b>        | <b>: 1+0=1</b>                          |
| <b>Course Code</b>         | <b>: Theory (MDE25-212)</b>             |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                    |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                            |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/16</b>                          |
| <b>Marks</b>               | <b>: Theory (50)</b>                    |
| <b>Instructor Name</b>     | <b>: Engr. Umair Ali Abro</b>           |

**DESCRIPTION:**

Occupational Health and Safety (OHS) is a crucial discipline focused on ensuring the safety, health, and welfare of people engaged in work or employment. This course introduces students to workplace hazards, safety regulations, risk management strategies, and health promotion in various industrial and engineering settings. Students will learn to identify potential risks, implement preventative strategies, and comply with safety standards. The course empowers future engineers to design safer systems and promote a culture of safety within organizations.

**Mapping of SDGs**

|                                    |                                                                                                                                            |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 3: Good Health and Well-being: | 3.9: substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. |
| SDG13. Climate Action              | 13.1: Strengthen resilience and adaptive capacity to climate related hazards and natural disasters.....                                    |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|        | CLO | Description                                                                                                                      | Domain    | Taxonomy level | PLO | Marks |
|--------|-----|----------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| Theory | 1   | <b>Explain</b> the principles, importance, and legal requirements of occupational health and safety in engineering environments. | Cognitive | C2             | 2   | 30    |
|        | 2   | <b>Identify</b> and assess workplace hazards and recommend appropriate risk control measures.                                    | Cognitive | C4             | 4   | 20    |

**COURSE OUTLINE (THEORY):**

Introduction to Occupational Health and Safety, Health and Safety Legislation, Hazard Identification and Risk Assessment, Safety Management Systems (SMS), Occupational Health, Fire and Electrical Safety, Construction and Industrial Safety, Safety Culture and Human Behavior, Environmental and Psychological Aspects, Case Studies and Practical Applications. Hazards and Risk and types of hazards: Physical (mechanical and non-mechanical), Chemical (Toxic and biological agents), electrical, fire, construction, heat and temperature, noise and vibration, falling and lifting etc.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] J. Stranks, The A–Z of Health and Safety, latest ed.
- [2] J. Stranks, The Manager’s Guide to Health & Safety at Work, latest ed.
- [3] Ogletree, Deakins, Nash, Smoak & Stewart, Occupational Safety and Health Law Handbook, latest ed.



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                                  |
|----------------------------|----------------------------------|
| <b>Subject Name</b>        | <b>: Digital Logic Design</b>    |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                   |
| <b>Course Code</b>         | <b>: Theory (EE25-213)</b>       |
|                            | <b>: Practical (EE25-214)</b>    |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>             |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                     |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                |
| <b>Marks</b>               | <b>: Theory (100)</b>            |
|                            | <b>: Practical (50)</b>          |
| <b>Instructor Name</b>     | <b>: Mr. Waseem Javed Soomro</b> |

### DESCRIPTION

Digital Logic Design is the study of how electronic systems process binary information (0s and 1s) using logic gates and circuits. It forms the foundation of digital electronics, including computers and communication systems. Binary number systems, Logic gates (AND, OR, NOT, etc.), Boolean algebra, Combinational and sequential circuits

### **Mapping of SDGs**

|                                                  |                                                                                      |
|--------------------------------------------------|--------------------------------------------------------------------------------------|
| SDG 9: Industry, Innovation, and Infrastructure: | 9.c: significantly increase access to information and communications technology..... |
|--------------------------------------------------|--------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                        | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
|               | 1   | <b>Define</b> the fundamentals and underlying principles of digital design.                                                                        | Cognitive | C1             | 1   | 10    |
| <b>Theory</b> | 2   | <b>Solve</b> number systems, logic conversions, and gate-level minimization using K-maps, following combinational logic design procedures.         | Cognitive | C3             | 2   | 60    |
|               | 3   | <b>Differentiate</b> between various combinational and sequential logic circuits based on their functionality and applications in digital systems. | Cognitive | C3             | 3   | 30    |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                    | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|--------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Design</b> and implement small-scale logic circuits (basic, combinational, Sequential, Digital circuit) for desired output. | Psychomotor | P4             | 4   | 50    |

## **COURSE OUTLINE (THEORY):**

Binary Systems, Boolean Algebra & Logic Gates, Combinational Logic, Sequential Circuits, Registers & Counters, Introduction to Arithmetic Logic Units.

## **COURSE OUTLINE (PRACTICAL):**

Basic logic gates; Verilog simulation and hardware implementation of combinational circuits such as MUX/DEMUX, encoder/decoder, arithmetic logic unit (ALU); Verilog simulation and hardware implementation of sequential circuits such as flip-flops, registers, shift registers, counters; implementation of logic circuits using SPLDs; project solving a real-life problem.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] M. M. Mano and C. R. Kime, Logic and Computer Design Fundamentals, latest ed. Prentice Hall.
- [2] T. L. Floyd, Digital Fundamentals, latest ed. Prentice Hall.
- [3] R. Tokheim, Digital Electronics: Principles and Applications, latest ed. Career Education.
- [4] W. Kleitz, Digital Electronics: A Practical Approach with VHDL, latest ed. Pearson.
- [5] M. M. Mano and M. D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, latest ed. Prentice Hall.



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                                         |
|----------------------------|-----------------------------------------|
| <b>Subject Name</b>        | <b>: Data Structures and Algorithms</b> |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                          |
| <b>Course Code</b>         | <b>: Theory (CS25-215)</b>              |
|                            | <b>: Practical (CS25-216)</b>           |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                    |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                            |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                       |
| <b>Marks</b>               | <b>: Theory (100)</b>                   |
|                            | <b>: Practical (50)</b>                 |
| <b>Instructor Name</b>     | <b>: Engr. Mirza Altamash Baig</b>      |

**DESCRIPTION:**

Data Structures and Algorithms (DSA) are essential for writing efficient programs.

1. Data Structures organize data (e.g., arrays, stacks, trees).
2. Algorithms are step-by-step methods to solve problems (e.g., sorting, searching).
3. Mastering DSA improves performance and problem-solving in computing.

**Mapping of SDGs**

|                                                  |                                                                                                    |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------|
| SDG 8: Decent Work and Economic Growth:          | 8.3: ..... decent job creation, entrepreneurship.....                                              |
| SDG 9: Industry, Innovation, and Infrastructure: | 9.b: Support domestic technology development, research and innovation in developing countries..... |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                      | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|---------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> fundamental data structures and algorithm design principles.                             | Cognitive     | C2                    | 1          | 50           |
|               | 2          | <b>Analyze</b> various data structures such as arrays, stacks, queues, linked lists, trees, and graphs. | Cognitive     | C4                    | 3          | 30           |
|               | 3          | <b>Apply</b> algorithmic strategies such as recursion, divide-and-conquer,                              | Cognitive     | C3                    | 2          | 20           |



|  |  |                                                                          |  |  |  |  |
|--|--|--------------------------------------------------------------------------|--|--|--|--|
|  |  | dynamic programming, and greedy methods to solve computational problems. |  |  |  |  |
|--|--|--------------------------------------------------------------------------|--|--|--|--|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                                                                                                    | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Practice</b> the implementation of fundamental data structures and algorithms under guidance and manipulating them to solve computational problems and testing their efficiency through hands-on exercises and experiments. | Psychomotor | P3             | 4   | 50    |

### **COURSE OUTLINE (THEORY):**

Overview of data structures and algorithms, Basic concepts of complexity analysis, Recursion and divide-and-conquer strategies, sorting algorithms including merge sort, quick sort, heap sort, and radix sort, Search techniques including linear and binary search. Hashing (open addressing, chaining), Tree structures (binary trees, heaps, M-way and balanced trees), Graph algorithms for traversal, shortest path, and topological sorting using adjacency structures. Dynamic Programming (tabulation and memorization), Greedy algorithms for optimization problems, Memory management and garbage collection concepts

### **COURSE OUTLINE (PRACTICAL):**

Introduction to Programming Environment, Arrays and Strings, Linked Lists, Stacks, Queues, Recursion, Searching Algorithms, Sorting Algorithms, Hashing, Trees, Heaps and Priority Queues, Graphs, Dynamic Programming & Greedy Algorithms

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] A. Drozdek, Data Structures and Algorithms in C++, latest ed.
- [2] M. A. Weiss, Data Structures and Algorithm Analysis in Java, latest ed.
- [3] F. M. Carrano and T. M. Henry, Data Structures and Abstractions with Java, latest ed.
- [4] M. A. Weiss, Data Structures and Algorithm Analysis in C++, latest ed.
- [5] J. Lewis and J. Chase, Java Software Structures: Designing and Using Data Structures, latest ed.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                                     |
|----------------------------|-----------------------------------------------------|
| <b>Subject Name</b>        | <b>: Electrical Network Analysis</b>                |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                      |
| <b>Course Code</b>         | <b>: Theory (EE25-217)<br/>Practical (EE25-218)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                        |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                   |
| <b>Marks</b>               | <b>: Theory (100)<br/>Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Mr. Waseem Javed Soomro</b>                    |

### **DESCRIPTION**

Electrical Network Analysis involves the study of electric circuits using mathematical tools and techniques. It covers circuit laws, network theorems, AC/DC analysis, and transient behavior, helping engineers design and analyze real-world electrical systems.

### **Mapping of SDGs**

|                                                  |                                                                                                                                                                                         |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 9: Industry, Innovation, and Infrastructure: | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes.....                                                                               |
| SDG 4: Quality education                         | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |

### **COURSE LEARNING COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                   | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Analyze</b> the effects of power transfer, power dissipation, and power factor on power transmission.                             | Cognitive     | C4                    | 1          | 50           |
|               | 2          | <b>Apply</b> transform techniques to analyze circuits in the time domain and S-domain, and analyze RLC circuits while distinguishing | Cognitive     | C3                    | 2          | 50           |

|  |  |                                               |  |  |  |  |
|--|--|-----------------------------------------------|--|--|--|--|
|  |  | between transient and steady-state responses. |  |  |  |  |
|--|--|-----------------------------------------------|--|--|--|--|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                           | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Assemble</b> and operate basic electrical circuits under guidance, measure and record key quantities and confirm he expected theoretical behavior. | Psychomotor | P3             | 3   | 50    |

### **COURSE OUTLINE (THEORY)**

Integra-differential equations of circuits; transient analysis; source-free series and parallel RLC circuits; complete response of RLC circuit; resonance; lossless LC circuit; complex forcing functions; phase relationships for R, L and C; impedance and admittance; sinusoidal steady-state response; quality factor; power factor and power factor improvement; complex frequency; three-phase balanced and unbalanced circuits; three-phase source-load connections; power relationships; magnetically-coupled circuits (mutual inductance, energy considerations, ideal transformers); variable frequency network performance; variable frequency response analysis; sinusoidal frequency analysis; Analysis of Circuits using Laplace Transform and Bode Plot; Analysis of Circuits using Fourier Series; resonant circuits and filter circuits; general two-port networks; impedance and admittance parameters; transmission parameters; hybrid parameters; and interconnection of two port networks.

### **COURSE OUTLINE (PRACTICAL)**

Basic RL and RC circuits, RLC circuit, sinusoidal steady-state analysis, AC power circuit analysis, poly phase circuits, frequency-domain analysis and Bode plots, network analysis in the s-domain, mutual inductance and transformers, two-port networks, circuit analysis techniques using software packages such as PSPICE, Electronic Workbench, Multi-Sim, and Lab View.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] W. H. Hayt Jr. and J. E. Kemmerly, Engineering Circuit Analysis, latest ed.
- [2] R. L. Boylestad, Introductory Circuit Analysis, latest ed.
- [3] S. Franco, Electric Circuits Fundamentals, latest ed. Oxford University Press.
- [4] V. V. Burg, Network Analysis, latest ed.
- [5] J. D. Irwin and R. M. Nelms, Basic Engineering Circuit Analysis, latest ed. Wiley.

## **Second Year - Fourth Semester**



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                                   |
|----------------------------|---------------------------------------------------|
| <b>Subject Name</b>        | <b>: Probability and Statistics for Engineers</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                                    |
| <b>Course Code</b>         | <b>: Theory (EE25-220)</b>                        |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                              |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                      |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                                    |
| <b>Marks</b>               | <b>: Theory (50)</b>                              |
| <b>Instructor Name</b>     | <b>: Engr. Fozia Hajano</b>                       |

### DESCRIPTION

This course provides an introduction to probability theory and statistical methods, with a focus on applications in engineering. Students will learn the fundamental concepts of probability, random variables, probability distributions, and statistical inference. The course emphasizes the practical application of statistical techniques to solve engineering problems, including the analysis of data, estimation of parameters, hypothesis testing, and regression analysis. Students will also gain experience with statistical software to analyze and interpret data from real-world engineering contexts. By the end of the course, students will be equipped with the tools necessary to make informed decisions based on uncertainty and variability in engineering systems.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                         | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-----------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Define</b> basic probability concepts and their use in different problems.                       | Cognitive | C1             | 1   | 20    |
|               | 2   | <b>Apply</b> basic statistical techniques such as regression and curve fitting to engineering data. | Cognitive | C3             | 2   | 10    |
|               | 3   | <b>Analyze</b> different types of random variables to solve problems. in science and engineering    | Cognitive | C4             | 4   | 20    |

## **COURSE OUTLINE (THEORY)**

Basic Statistical Parameters and Data Representation, Set theory, basic concepts of probability, conditional probability, independent events, Bayes' formula, discrete and continuous random variables, distributions and density functions, probability distributions (binomial, Poisson, Hypergeometric, Gaussian, uniform and exponential) functions, mean, variance, standard deviations, moments and moment generating functions, linear regression and curve fitting, limits theorems, stochastic processes, first and second order characteristics, applications. Measure of Central Pendency and Dispersion, Error Functions and Q-Functions, finding probabilities of a normally distributed random variable by using Standard Normal Curve.

## **RECOMMENDED/REFERENCE BOOKS**

- [1] A. Leon-Garcia, Probability, Statistics and Random Processes for Electrical Engineering, latest ed.
- [2] R. D. Yates and D. J. Goodman, Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers, latest ed.
- [3] A. Papoulis and S. U. Pillai, Probability, Random Variables and Stochastic Processes, latest ed.
- [4] M. A. Solangi, Statistical Methods and Estimations, latest ed.
- [5] D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, latest ed.
- [6] S. M. Ross, A First Course in Probability, latest ed.



**Department of Electronic Engineering  
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|                            |                             |
|----------------------------|-----------------------------|
| <b>Subject Name</b>        | <b>: Islamic Studies</b>    |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>              |
| <b>Course Code</b>         | <b>: Theory (HUM25-221)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>        |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>              |
| <b>Office Hours</b>        | <b>: 2-hours/ week</b>      |
| <b>Marks</b>               | <b>: Theory (50)</b>        |
| <b>Instructor Name</b>     | <b>: Mr. Sibghatullah</b>   |

**DESCRIPTION:**

This course provides an introduction to the rich history, culture, and foundational principles of Islam. It explores the life and teachings of Prophet Muhammad (PBUH), the Quran, and the Hadith, alongside key Islamic concepts such as Tawhid (Oneness of God), Ibadah (Worship), and the Five Pillars of Islam. Students will also study Islamic law (Shariah), ethics, and the historical development of Islamic civilization, focusing on its contributions to science, philosophy, and arts. The course aims to foster a deeper understanding of Islamic values and their application in contemporary society, while promoting critical thinking and interfaith dialogue.

**Mapping of SDGs**

|                                                |                                                                                    |
|------------------------------------------------|------------------------------------------------------------------------------------|
| SDG 10: Reduced inequalities                   | 10.2: ..... empower and promote the social, economic .... inclusion of all.....    |
| SDG 16: Peace, Justice and Strong Institutions | 16.6: ..... effective, accountable and transparent institutions at all levels..... |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                          | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Express</b> scope and significance of basic beliefs and pillars of Islam, their effects on different aspects of individual life and society.      | Affective | A3             | 7   | 25    |
|               | 2   | <b>Apply</b> understanding of the Holy Quran (Fehm-e-Quran), Hadith, and the life of Prophet Muhammad (PBUH) as sources of inspiration and guidance. | Cognitive | C3             | 9   | 25    |

## **COURSE OUTLINE (THEORY)**

Introduction to Quranic Studies Basic Concepts of Quran. History of the Holy Quran Uloom-ul-Quran Study of Selected Text of the Holy Quran. Verses of Surah Al-Baqara Related to Faith (Verse No-284-286). Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18). Verses of Surah Al-Mumanoon Related to Characteristics of the faithful (Verse No-1-11). Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77). Verses of Surah Al-Inam Related to Ihkam (Verse No-162-164). Study of Selected Text of the Holy Quran. Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6, 21, 40, 56, 57, 58.).Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment .Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14).Seerat of the Holy Prophet (S.A.W) I. Life of Muhammad Bin Abdullah (Before Prophet Hood).Life of Holy Prophet (S.A.W) in Makkah. Important Lessons Derived from the life of Holy Prophet (S.A.W) in Makkah Seerat of the Holy Prophet (S.A.W) II Life of the Holy Prophet (S.A.W) in Madina. Important Events of Life Holy Prophet (S.A.W) in Madina. Important Lessons Derived from the life of the Holy Prophet (S.A. W) in Madina. Introduction to Sunnah Basic Concepts o-f Hadith History of Hadith Kinds -of Hadith Uloom –ul-Hadith Sunnah & Hadith Legal Position of Sunnah. Selected Study from Text of Hadith. Introduction to Islamic Law & Jurisprudence. Basic Concepts of Islamic Law & Jurisprudence. History & Importance of Islamic Law & Jurisprudence. Sources of Islamic Law & Jurisprudence. Nature of Differences in Islamic Law. Islam and Sectarianism. Islamic Culture & Civilization. Basic Concepts of Islamic Culture & Civilization. Historical Development of Islamic Culture & Civilization. Characteristics of Islamic Culture & Civilization. Islamic Culture & Civilization and Contemporary Issues. Islam & Science. Basic Concepts of Islam & Science. Contributions of Muslims in the Development of Science. Quran & Science. Islamic Economic System. Basic Concepts of Islamic Economic System. Means of Distribution of wealth in Islamic Economics. Islamic Concept of Riba. Islamic Ways of Trade & Commerce. Political System of Islam. Basic Concepts of Islamic Political System. Islamic Concept of Sovereignty. Basic Institutions of Govt. in Islam. Islamic History. Period of Khlaft-E-Rashida. Period of Umayyads. Period of Abbasids. Social System of Islam. Basic Concepts of Social System of Islam. Elements of Family. Ethical Values of Islam

## **RECOMMENDED/REFERENCE BOOKS**

- [1] M. H. Hamidullah, Emergence of Islam, latest ed. Islamabad, Pakistan: Islamic Research Institute.
- [2] M. H. Hamidullah, Muslim Conduct of State, latest ed.
- [3] M. H. Hamidullah, Introduction to Islam, latest ed.
- [4] M. Y. Islahi, complete title and publication details to be inserted from the approved course bibliography.
- [5] H. H. Hassan, An Introduction to the Study of Islamic Law, latest ed. Islamabad, Pakistan: Leaf Publications.
- [6] A. Hasan, Principles of Islamic Jurisprudence, latest ed. Islamabad, Pakistan: Islamic Research Institute, International Islamic University.
- [7] M. Waliullah, Muslim Jurisprudence and the Quranic Law of Crimes, latest ed. Islamic Book Service.





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**Subject Name** : Ethics  
**Credit Hours** : 2+0=2  
**Course Code** : Theory (HUM25-221)  
**Effective** : 2K25-BE(EE)  
**Pre-Requisites** : Nil  
**Weeks/Lectures/Labs** : 16/32  
**Marks** : Theory (50)  
**Instructor Name** : Mr. Muzammil Ahmed Ansari

### **DESCRIPTION**

This course introduces the fundamental concepts of ethics, including the study of moral philosophies, ethical principles, professional and social responsibilities, human values, cultural and civic understanding, and the social, economic, and ethical dimensions of human behavior and society.

#### **Mapping of SDGs**

|                                                |                                                                                    |
|------------------------------------------------|------------------------------------------------------------------------------------|
| SDG 10: Reduced inequalities                   | 10.2: ..... empower and promote the social, economic .... inclusion of all.....    |
| SDG 16: Peace, Justice and Strong Institutions | 16.6: ..... effective, accountable and transparent institutions at all levels..... |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                          | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|----------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Explain</b> the scope and significance of ethics, moral values, and their effects on individual life and society. | Cognitive | C2             | 6   | 25    |
|               | 2   | <b>Apply</b> ethical principles and moral reasoning to personal, professional, and societal situations.              | Cognitive | C3             | 8   | 25    |

Introduction to Ethics (basic concepts of ethics, nature and scope of ethics, ethics and morality, ethics and values, importance of ethics in individual and social life), Historical Development of Ethical Thought (ancient ethical traditions, Greek ethics, medieval and modern ethical philosophies, contemporary ethical perspectives), Ethical Theories (utilitarianism, deontology, virtue ethics, egoism, intuitionism, rationalism, moral reasoning and decision making), Ethics and Religion (relationship between ethics and religion, ethical teachings of major world religions including Christianity, Hinduism, Buddhism, Judaism, Sikhism, Islam, and

Zoroastrianism), Professional and Applied Ethics (professional ethics, business ethics, engineering ethics, teacher and student ethics, environmental ethics, media ethics, bioethics), Human Values and Society (justice, tolerance, honesty, integrity, responsibility, human rights, social harmony, peaceful coexistence), Ethics and Contemporary Issues (ethics in science and technology, ethics in economics and politics, globalization and cultural diversity, ethics in social media and communication), Ethical Decision Making (critical thinking, ethical dilemmas, case studies, conflict resolution, moral accountability), Civic and Social Responsibilities (citizenship, community service, leadership, respect for diversity, social welfare and sustainable development).

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] W. Lillie, *An Introduction to Ethics*. London, U.K.: Methuen & Co. Ltd. Available: *An Introduction to Ethics*. Accessed: May 19, 2026.
- [2] J. S. Mackenzie, *A Manual of Ethics*. London, U.K.: University Tutorial Press. Available: *A Manual of Ethics*. Accessed: May 19, 2026.
- [3] M. W. Martin and R. Schinzinger, *Ethics in Engineering*, 4th ed. New York, NY, USA: McGraw-Hill. Available: *Ethics in Engineering*. Accessed: May 19, 2026.
- [4] C. E. Harris, M. S. Pritchard, and M. J. Rabins, *Engineering Ethics: Concepts and Cases*, 4th ed. Boston, MA, USA: Wadsworth Cengage Learning. Available: *Engineering Ethics Concepts and Cases*. Accessed: May 19, 2026.
- [5] J. Rachels and S. Rachels, *The Elements of Moral Philosophy*, 9th ed. New York, NY, USA: McGraw-Hill Education. Available: *The Elements of Moral Philosophy*. Accessed: May 19, 2026.



**Department of Electronic Engineering**  
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|                            |                                       |
|----------------------------|---------------------------------------|
| <b>Subject Name</b>        | <b>: Engineering Mechanics</b>        |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                        |
| <b>Course Code</b>         | <b>: Theory (MDE25-222)</b>           |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                  |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                          |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                        |
| <b>Marks</b>               | <b>: Theory (50)</b>                  |
| <b>Instructor Name</b>     | <b>: Engr. Dr Aamir Hussain Memon</b> |

### **DESCRIPTION**

This course introduces the fundamental principles of mechanics as they apply to the analysis of static and dynamic systems in engineering. Topics include the study of forces, moments, equilibrium, and motion of rigid bodies. Students will explore key concepts such as Newton's Laws of Motion, work and energy, and the principles of rigid body dynamics. The course also covers topics such as trusses, beams, friction, and kinematics of particles. Through problem-solving and real-world applications, students will develop the ability to model and analyze the mechanical behavior of structures and systems, preparing them for advanced studies in various engineering disciplines.

### **Mapping of SDGs**

|                            |                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation | 9.5: ..... encouraging innovation and substantially increasing the number of research and development workers..... |
|----------------------------|--------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                          | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Describe</b> the principles of statics and dynamics to solve engineering problems involving forces, moments, and motion of rigid bodies. | Cognitive     | C2                    | 1          | 25           |
|               | 2          | <b>Apply</b> understanding of forces, equilibrium, and motion in mechanical systems to explain the underlying concepts and mechanisms.      | Cognitive     | C3                    | 2          | 25           |

## **COURSE OUTLINE (THEORY):**

Introduction: Definitions and scope of Applied Mechanics, Concept of Rigid and Deformed Bodies Fundamental concepts and principles of mechanics: Newtonian Mechanics Basic Concept in Statics and Static Equilibrium. Concept of Particles and Free Body Diagram Physical meaning of Equilibrium and its essence in structural application, Equation of Equilibrium in Two Dimension, Forces acting on particle and rigid body. Different types of Forces: Point. Surface Traction and Body Forces - Translational Force and Rotational Force: Relevant Examples, Resolution and Composition of Forces: Relevant Examples, Principle of Transmissibility and Equivalent Forces: Relevant Examples, Moments and couples: Relevant Examples, Resolution of a Force into Forces and a Couple: Relevant Example, Resultant of Force and Moment for a System of Force: Example, Center of Gravity, Centroid and .Moment of Inertia, Concepts and Calculation of Centre of Gravity and Centroid: Examples, Calculation of Second Moment of Area / Moment of Inertia and Radius of Gyration and Relevant usages, Use of Parallel axis Theorem: Relevant Examples. Friction Laws of Friction. Static and Dynamic Coefficient of Friction. Angle of Friction: Engineering Examples of usage of friction, Calculations involving friction in structures: Example as High-Tension Friction Grip bolts and its free body diagram, Analysis of Beams and Frames, Introduction to Structures: Discrete and Continuum, Concept of Load Estimating and Support Idealizations: Examples and Standard symbols, Use of beams<sup>1</sup> frames in engineering: Concept of rigid joints 'distribute loads in beams, frames. Concept of Statically/Cinematically Determinate and Indeterminate Beams and Frames: Relevant Examples, Calculation of Axial Force, Shear Force and Bending Moment for Determinate Beams and Frames, Axial Force. Shear Force and Bending Moment Diagrams and Examples for drawing it Analysis of Plane Trusses. Use of trusses in engineering: Concept of pin joints joint loads in trusses. Calculation of Member Forces of Truss by method of joints: Simple Examples. Calculation of Member Forces of Truss by method of sections: Simple Examples. Kinematics of Particles and Rigid Body. Rectilinear Kinematics: Continuous Motion. Position. Velocity and Acceleration of a Particle and Rigid Body. Determination of Motion of Particle and Rigid Body. Uniform Rectilinear Motion of Particles. Uniformly Accelerated Rectilinear Motion of Particles. Curvilinear Motion: Rectangular Components with Examples of Particles. Kinetics of Particles and Rigid Body! Force and Acceleration. Newton's Second Law of Motion and momentum. Equation of Motion and Dynamic Equilibrium: Relevant Examples. Angular Momentum and Rate of Change. Equation of Motion-Rectilinear and Curvilinear. Rectangular: Tangential and Normal Components and Polar Coordinates: Radial and Transverse Components

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] E. R. Beer and E. R. Johnston Jr., Mechanics for Engineers: Statics and Dynamics, latest ed. McGraw-Hill.
- [2] R. C. Hibbeler and A. Gupta, Engineering Mechanics: Statics and Dynamics, latest ed. Pearson.
- [3] I. C. Jong and B. G. Rogers, Engineering Mechanics: Statics and Dynamics, latest ed.
- [4] D. K. Anand and P. F. Cunniff, Engineering Mechanics: Statics and Dynamics, latest ed.
- [5] R. S. Khurmi, A Textbook of Engineering Mechanics, latest ed.

- [6] R. S. Khurmi, Applied Mechanics and Strength of Materials, latest ed.
- [7] I. B. Prasad, A Textbook of Applied Mechanics, latest ed.



**Department of Electronic Engineering**  
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|                            |                                       |
|----------------------------|---------------------------------------|
| <b>Subject Name</b>        | <b>: Electromagnetic Field Theory</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                        |
| <b>Course Code</b>         | <b>: Theory (EE25-223)</b>            |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                  |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                          |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                        |
| <b>Marks</b>               | <b>: Theory (50)</b>                  |
| <b>Instructor Name</b>     | <b>: Dr. Shahnawaz Shah</b>           |

### **DESCRIPTION**

This course provides a comprehensive introduction to the fundamental principles of electromagnetic field theory, focusing on the behavior of electric and magnetic fields in static and dynamic conditions. Topics include electrostatics, magnetostatics, Maxwell's equations, electromagnetic waves, and the behavior of fields in various materials. Students will also study the concepts of electric and magnetic potentials, boundary conditions, and the propagation of electromagnetic waves in free space and dielectric media. The course emphasizes both theoretical concepts and practical applications of electromagnetic fields in engineering, including waveguides, transmission lines, and antennas. Through problem-solving and simulations, students will develop the ability to analyze and design systems influenced by electromagnetic fields.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                      |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4:... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                       | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Describe</b> vector algebra and vector calculus in commonly used orthogonal coordinate systems and introduce operations frequently used throughout the course. | Cognitive | C2             | 1   | 20    |
|               | 2   | <b>Analyze</b> the behavior of stationary and moving charges to understand steady currents and apply these concepts in various situations.                        | Cognitive | C4             | 2   | 10    |

|  |   |                                                                                               |           |    |   |    |
|--|---|-----------------------------------------------------------------------------------------------|-----------|----|---|----|
|  | 3 | <b>Formulate</b> and <b>analyze</b> problems involving time-dependent electromagnetic fields. | Cognitive | C4 | 3 | 20 |
|--|---|-----------------------------------------------------------------------------------------------|-----------|----|---|----|

### **COURSE OUTLINE (THEORY):**

Vector analysis, Coulombs law and electric field intensity, Gauss's law, flux density and divergence, energy and potential, conductor dielectric and capacitance, Poisson's and Laplace's equations, steady-state magnetic field, magnetic forces, materials and inductance, time-varying fields and Maxwell's equations, uniform plane waves.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] J. D. Kraus and R. J. Carver, Electromagnetics, latest ed. McGraw-Hill.
- [2] D. K. Cheng, Fundamentals of Engineering Electromagnetics, latest ed. Addison-Wesley.
- [3] W. H. Hayt Jr. and J. A. Buck, Engineering Electromagnetics, latest ed. McGraw-Hill.
- [4] M. N. O. Sadiku, Elements of Electromagnetics, latest ed. Oxford University Press.
- [5] J. D. Kraus, Electromagnetics, latest ed. John Wiley & Sons.





**Department of Electronic Engineering**  
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|                            |                                   |
|----------------------------|-----------------------------------|
| <b>Subject Name</b>        | <b>: Signals and Systems</b>      |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                    |
| <b>Course Code</b>         | <b>: Theory (EE25-224)</b>        |
|                            | <b>: Practical (EE25-225)</b>     |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>               |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                      |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                 |
| <b>Marks</b>               | <b>: Theory (100)</b>             |
|                            | <b>: Practical (50)</b>           |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Beenish Ansari</b> |

### **DESCRIPTION**

This course introduces the fundamental concepts of signals and systems, which are essential in the analysis and processing of signals in various engineering applications. Topics include classification of signals, time-domain and frequency-domain analysis, linear time-invariant (LTI) systems, and system properties such as stability, causality, and impulse response. The course covers both continuous-time and discrete-time signals and systems, with an emphasis on Fourier series, Fourier transform, and Laplace transform techniques for analyzing signals in the frequency domain. Students will also explore system representation, convolution, and the sampling theorem. The course aims to provide students with the tools to analyze and design systems for signal processing, communication, and control applications.

### **Mapping of SDGs**

|                                         |                                                                                        |
|-----------------------------------------|----------------------------------------------------------------------------------------|
| SDG 8: Decent Work and Economic Growth: | 8.6: ..... reduce the proportion of youth not in employment, education or training.... |
|-----------------------------------------|----------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                      | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Explain</b> the fundamental concepts, properties of continuous-time signal and systems in time-domain, and perform various signal operations. | Cognitive | C2             | 1   | 40    |
|               | 2   | <b>Apply</b> and solve problems related to signals and systems in the time, frequency, and complex frequency domains.                            | Cognitive | C3             | 2   | 50    |



|  |   |                                                                                                                     |           |    |   |    |
|--|---|---------------------------------------------------------------------------------------------------------------------|-----------|----|---|----|
|  | 3 | <b>Evaluate</b> continuous-time systems, including filter design with appropriate properties and windowing methods. | Cognitive | C5 | 3 | 10 |
|--|---|---------------------------------------------------------------------------------------------------------------------|-----------|----|---|----|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                       | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|-------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Practice</b> signals using MATLAB simulations under guidance and analyze systems in time and frequency domain. | Psychomotor | P3             | 5   | 50    |

### **COURSE OUTLINE (THEORY):**

Introduction to signals and systems, classification of signals, classification of systems, complex number applications, time-domain analysis of LTI systems, BIBO stability, Laplace transform and its applications, continuous time Fourier series, Fourier transform, frequency domain, Z-transform and its applications, introduction to analog filter design

### **COURSE OUTLINE (PRACTICAL):**

Introduction to signals and systems, classification of signals, classification of systems, complex number applications, time-domain analysis of LTI systems, BIBO stability, Laplace transform and its applications, continuous time Fourier series, Fourier transform, frequency domain, Z-transform and its applications, introduction to analog filter design.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, Signals and Systems, latest ed. Prentice Hall.
- [2] B. P. Lathi, Linear Systems and Signals, latest ed. Oxford University Press.
- [3] M. J. Roberts, Fundamentals of Signals and Systems, latest ed. McGraw-Hill.
- [4] S. Haykin and B. Van Veen, Signals and Systems, latest ed. Wiley.
- [5] C. L. Phillips, J. M. Parr, and E. A. Riskin, Signals, Systems, and Transforms, latest ed. Prentice Hall.



**Department of Electronic Engineering  
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|                            |                                                     |
|----------------------------|-----------------------------------------------------|
| <b>Subject Name</b>        | <b>: Electronic Circuit Design</b>                  |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                      |
| <b>Course Code</b>         | <b>: Theory (EE25-226)<br/>Practical (EE25-227)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                        |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                   |
| <b>Marks</b>               | <b>: Theory (100)<br/>Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Engr. Fozia Hajano</b>                         |

### DESCRIPTION

This course focuses on the analysis, design, and implementation of analog and digital electronic circuits. Students will study the characteristics and applications of key electronic components such as diodes, transistors (BJT and MOSFET), and operational amplifiers. The course emphasizes the design of amplifiers, oscillators, filters, and voltage regulators, along with practical considerations like biasing, stability, and frequency response. Simulation tools and circuit design software will be used to model and test electronic circuits. By the end of the course, students will be able to design functional electronic circuits for real-world applications in communication, control, and embedded systems.

### **Mapping of SDGs**

|                            |                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes..... |
|----------------------------|-----------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                             | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Define</b> the basic concepts of amplifiers and its behavioral analysis with the help of hybrid parameters, AC & DC load lines                       | Cognitive | C1             | 1   | 30    |
|               | 2   | <b>Distinguish</b> the frequency characteristics and stability analysis of different electronic devices including filters, amplifiers, and oscillators. | Cognitive | C2             | 2   | 52    |

|  |   |                                                                       |           |    |   |    |
|--|---|-----------------------------------------------------------------------|-----------|----|---|----|
|  | 3 | <b>Apply</b> Kirchhoff laws (current/voltage) in electronic circuits. | Cognitive | C3 | 3 | 18 |
|--|---|-----------------------------------------------------------------------|-----------|----|---|----|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                             | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|---------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Practice</b> the amplifier circuits based on semiconductor devices under guidance in the laboratory. | Psychomotor | P3             | 4   | 50    |

### **COURSE OUTLINE (THEORY)**

Amplifier analysis: Transistor as an amplifier, hybrid model of a transistor, small-signal analysis, large-signal analysis, gain calculation of single-stage amplifier, cascading, multistage gain calculations. Classification of amplifiers on the basis of biasing: Class A amplifier, class B amplifier, class AB amplifier, class C amplifier, push-pull amplifier, and complementary symmetry amplifier. Classification of amplifiers on the basis of coupling: RC-coupled amplifier, transformer-coupled amplifier, direct-coupled amplifier. Classification of amplifiers on the basis of frequency: Audio-frequency amplifier, radio-frequency amplifier, tuned amplifiers. Feedback: Feedback concept, feedback amplifiers, voltage feedback amplifier, current feedback amplifier. Effect of feedback on frequency response. Practical amplifier considerations: Input and output impedance, amplifier loading, impedance matching. Oscillators: Basic theory, tank circuit, damped and undamped oscillations, phase-shift oscillator, Colpitts oscillator, Hartley oscillator, Wein Bridge oscillator, Clapp oscillator.

### **COURSE OUTLINE (PRACTICAL)**

Transistor curve tracer, introduction to PSPICE and AC voltage dividers, characterization and design of emitter and source followers, characterization and design of AC variable-gain amplifier, design of test circuits for BJTs and FETs, design of FET ring oscillators, design and characterization of emitter-coupled transistor pairs, tuned amplifier and oscillator, design of oscillators.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] A. S. Sedra and K. C. Smith, Microelectronic Circuits, latest ed. Oxford University Press.
- [2] B. Razavi, Fundamentals of Microelectronics, latest ed. Wiley.
- [3] R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, latest ed. Prentice Hall.
- [4] T. L. Floyd, Electronic Devices (Conventional Current Version), latest ed. Prentice Hall.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                                |
|----------------------------|------------------------------------------------|
| <b>Subject Name</b>        | <b>: Ideology and Constitution of Pakistan</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                                 |
| <b>Course Code</b>         | <b>: Theory (HUM25-228)</b>                    |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                           |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                   |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                                 |
| <b>Marks</b>               | <b>: Theory (50)</b>                           |
| <b>Instructor Name</b>     | <b>: Mr. Sibghatullah</b>                      |

### **DESCRIPTION**

This course introduces the historical development, ideological foundations, and constitutional framework of Pakistan. It emphasizes the structure of state institutions, fundamental rights, civic responsibilities, and the significance of constitutional governance in Pakistan.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.7: ..... ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles... |
| SDG 5: Gender equality   | 5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.                                                 |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                              | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|-----------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Analyze</b> the structure, roles, and functions of state institutions under the Constitution of Pakistan.    | Cognitive     | C4                    | 7          | 25           |
|               | 2          | <b>Evaluate</b> contemporary constitutional issues, fundamental rights, and civic responsibilities of citizens. | Cognitive     | C5                    | 11         | 25           |

### **COURSE OUTLINE (THEORY):**

Ideological Foundations of Pakistan: Meaning and significance of ideology, Ideology of Pakistan and the Two-Nation Theory, Role of Islam in shaping Muslim identity, Vision of Allama Muhammad Iqbal, Political struggle of Muslims in the Subcontinent. Pakistan

Movement: Sir Syed Ahmad Khan and Aligarh Movement. Role of All-India Muslim League  
Key events: Lahore Resolution (1940), Elections of 1945–46, Leadership of Quaid-e-Azam Muhammad Ali Jinnah. Constitutional Development (1947–1973). Government of India Act 1935 (as an interim constitution), Objectives Resolution (1949), Constitution of 1956, Constitution of 1962, salient features of the Constitution of 1973, salient features of the Constitution of 1973, Islamic provisions, Fundamental rights and duties, Federal system, Parliamentary form of government, Independence of judiciary: State Institutions and Governance, Legislature, Executive, and Judiciary, Role of President and Prime Minister, Federal and Provincial governments, Election system and accountability institutions. Constitutional Amendments and Contemporary Issues, Important constitutional amendments, 18th Amendment and provincial autonomy, Challenges to democracy and constitutional rule, Role of citizens in strengthening the constitution.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] The Constitution of the Islamic Republic of Pakistan, 1973, official text.
- [2] K. B. Sayeed, Pakistan: The Formative Phase, latest ed.
- [3] I. H. Qureshi, The Struggle for Pakistan, latest ed.
- [4] S. M. Burke and L. Ziring, Pakistan's Foreign Policy: An Historical Analysis, latest ed.
- [5] K. K. Aziz, The Making of Pakistan: A Study in Nationalism, latest ed.

## **Third Year - Fifth Semester**



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                               |
|----------------------------|-------------------------------|
| <b>Subject Name</b>        | <b>: Project Management</b>   |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                |
| <b>Course Code</b>         | <b>: Theory (MS25-310)</b>    |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>           |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                  |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                |
| <b>Marks</b>               | <b>: Theory (50)</b>          |
| <b>Instructor Name</b>     | <b>: Engr. Umair Ali Abro</b> |

### **DESCRIPTION**

The primary objective of this course is to get the fair understanding of core issues pertaining to Engineering Project Management. This course is aimed at providing both basic and some advanced exposure to emerging trends in the field of Project Management, so as to enable the engineering professionals of tomorrow to successfully complete sophisticated projects within the constraints of capital, time, and other resources with due regards to stakeholders set of expectations. Engineering students will learn key Project Management skills and strategies and will be able to face emerging challenges.

#### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                               | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|----------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Understand</b> the concept of a sustainable lifestyle and explain why a sustainable society is important for the environment. | Cognitive     | C2                    | 6          | 10           |
|               | 2          | <b>Analyze</b> project-management knowledge areas, including risk, quality, stakeholder, schedule, and cost management.          | Cognitive     | C4                    | 10         | 20           |
|               | 3          | <b>Justify</b> time and cost estimates for complex tasks using project scheduling and control techniques, including CPM and EVM. | Cognitive     | C5                    | 11         | 20           |

## **COURSE OUTLINE (THEORY)**

Project Management Concepts: History of Project Management. Introduction to Project Management, Project, Program & Portfolio Management, Project characteristics, Objectives & Requirements. Project Phases 'Stages, Project Life Cycle, Project Environment, Project Scope & Project Charter, Project Manager, Project Stakeholder Analysis. Project Proposal Development. Project Proposal. Characteristics of good proposal. Types of Proposals. Request for Proposal. Request for Quotation etc). Proposal Templates etc. Project Feasibility. Brief review of various aspects of Project Feasibility like Technical. Social. Managerial. Economic. Financial & Marketing, Administrative etc. Project Selection Criteria (Economic Analysis of Engineering Projects) Using Break Even Analysis, Cost Benefit Ratio, Internal Rate of Return, Net Present Value etc. Project Contract & Procurement Management. Engineering contracts. Type of contracts, understanding of procurement Process & Cycle, PPRA Rules. Project Planning and Scheduling. Project Planning (Resource & HR Planning). Work Breakdown Structure. Project Network & Scheduling. Manning Schedule and Activity Charts, Critical Path Method (CPM)/Project Evaluation & Review Techniques. Project Costing & Estimation. Cost Estimation in Projects. Cost components in projects and methods for cost estimation in projects. Cost Control in Projects. Estimation of Outstanding Work. Earned Value Management. Schedule & cost variance analysis. Project HRM & Communication Management. Effective organization and communication for Successful Projects, Project Organizational Structures (Project matrix and project-based organizations). Project HR Plan preparation. HR Need Assessment and HR Matrix. Building and managing effective project team. Selection & control mechanism of HRM in Projects, Effective Communication Plan. Project Risk Management. Definitions Project Risk, Project Risk Management Tools. Types of Project Risk, Project Risk Assessment. Risk Identification and Mitigation, Monitoring & Controlling Risk, Generic Risk Management Strategies & Technique. Computer Application in Project Management. Basic. 'Elementary Introduction and hands on basic exposure of use of MS Project & Primavera P6 Software in Project Management. Project Quality Management. Defining Quality, Quality Assurance, Quality Management, Quality Improvement Tools as applied to Project Management, Project Quality Management Plan, Quality Management Processes and Strategies. Project Closure & Termination. Project Evaluation, defining project success. Project Completion Criteria, Project Audit. Project Termination & When to close a project, the termination process. Project Close Up & lesson learnt. & Project Archive

### **RECOMMENDED BOOKS:**

- [1] H. Kerzner, Project Management: A Systems Approach to Planning, Scheduling and Controlling, latest ed.
- [2] F. L. Bennett, The Management of Engineering. New York, NY, USA: Wiley.
- [3] D. I. Cleland, Field Guide to Project Management. New York, NY, USA: Wiley.
- [4] H. Eisner, Essentials of Project Management and Systems Engineering Management. New York, NY, USA: Wiley.
- [5] J. D. Frame, Managing Projects in Organizations. San Francisco, CA, USA: Jossey-Bass.
- [6] E. M. Goldratt, Critical Chain. New York, NY, USA: North River Press.



- [7] M. E. Haynes, Project Management: From Idea to Implementation. Los Altos, CA, USA: Crisp Publications.
- [8] J. P. Lewis, Project Planning, Scheduling & Control. New York, NY, USA: McGraw-Hill.
- [9] J. P. Lewis, Mastering Project Management. New York, NY, USA: McGraw-Hill.
- [10] B. Lientz and K. Rea, Project Management for the 21st Century. San Diego, CA, USA: Academic Press.
- [11] R. Miller and D. Lessard, The Strategic Management of Large Engineering Projects. Cambridge, MA, USA: MIT Press.
- [12] J. M. Nicholas, Managing Business & Engineering Projects. Englewood Cliffs, NJ, USA: Prentice Hall.
- [13] A. Shtub, J. F. Bard, and S. Globerson, Project Management: Engineering, Technology, and Implementation. Englewood Cliffs, NJ, USA: Prentice Hall.



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                                           |
|----------------------------|-------------------------------------------|
| <b>Subject Name</b>        | <b>: Instrumentation and Measurements</b> |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                            |
| <b>Course Code</b>         | <b>: Theory (EE25-311)</b>                |
|                            | <b>: Practical (EE25-312)</b>             |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                      |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                              |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                         |
| <b>Marks</b>               | <b>: Theory (100)</b>                     |
|                            | <b>: Practical (50)</b>                   |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Aamir Hussain Memon</b>    |

### **DESCRIPTION**

Concepts of accuracy, precision, sensitivity, resolution, repeatability, and calibration. Types of measurement errors and methods to minimize them Working principles, classification, and applications of sensors for measuring physical, chemical, and biological variables. Selection criteria of sensors for different engineering applications.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                              | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|-----------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> the fundamentals and elementary concepts of measurement and instrumentation systems              | Cognitive     | C2                    | 1          | 35           |
|               | 2          | <b>Illustrate</b> the working mechanism of different types of electrical and electronic instruments.            | Cognitive     | C3                    | 1          | 35           |
|               | 3          | <b>Apply</b> signal conditioning principles based on transducers and sensors related to instrumentation systems | Cognitive     | C3                    | 3          | 30           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                                      | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Operate</b> measurement instruments, sensors, and signal-conditioning circuits under guidance; record data and compare measured values with expected results. | Psychomotor | P3             | 5   | 50    |

## **COURSE OUTLINE (THEORY):**

Measurements: Precision measurements terminologies principles of different measurement techniques; Types of Errors: Instruments, Measurement of electrical and non-electrical quantities including voltmeters, ammeters, function generators, oscilloscopes; Systems for signal processing and signal transmission; modern Instrumentation techniques; Static and dynamic responses of instrumentation and signal conditioning; Data acquisition systems Principles of operation, construction and working of different analogue and Digital meters, Advanced Testing & Measuring instruments recording instruments, signal generators. Transducers: Sensors, input and output transducers; Types of bridges for measurement of resistance, inductance, and capacitance, Power and energy meters; high-voltage measurements, PLC systems.

## **COURSE OUTLINE (PRACTICAL):**

Design, construction, and analysis of measurement circuits, data acquisition circuits, instrumentation devices, and automatic testing; measurement of electrical parameters using different lab instruments; calibration of measurement instruments; use of data acquisition systems for presentation and interpretation of data; use of microcomputers to acquire and process data; use of simulation and instrumentation languages (LabVIEW).

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, latest ed.
- [2] K. B. Klaassen and S. Gee, Electronic Measurement and Instrumentation, latest ed. Cambridge University Press.
- [3] H. Kevin and J. H., PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, latest ed. Newnes.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



**Subject Name** : **Microprocessor and Interfacing**  
**Credit Hours** : 3+1=4  
**Course Code** : Theory (EE25-313)  
 : Practical (EE25-314)  
**Effective** : 2K25-BE(EE)  
**Pre-Requisites** : Nil  
**Weeks/Lectures/Labs** : 16/48/16  
**Marks** : Theory (100)  
 : Practical (50)  
**Instructor Name** : Engr. Abdul Manan Memon

### DESCRIPTION

The main objective of this course is to develop understanding of microprocessor and microcontroller-based systems and their applications. This includes enabling a student to design and use microprocessor-based systems for variety of purposes such as control, telemetry, digital systems etc. Course focuses on study of microprocessor and its basic support components including CPU architecture, memory interfaces, processor bus concepts, serial I/O devices, and interrupt control devices. Laboratories directly related to microprocessor functions and its interfaces.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                   | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Understand</b> various Micro-processor/Microcontroller features, describe their operations and use relevant development tools              | Cognitive | C2             | 2   | 50    |
|               | 2   | <b>Apply</b> the concept of C/Assembly language to perform basic tasks with Micro-processors /Micro-controllers and interface digital devices | Cognitive | C3             | 3   | 50    |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | <b>CLO</b> | <b>Description</b>                                                                                                                         | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Practical</b> | 1          | <b>Practice</b> the practical applications using 8086 microprocessors under guidance and demonstrate debugging and troubleshooting skills. | Psychomotor   | P3                    | 5          | 50           |

## **COURSE OUTLINE (THEORY):**

Introduction to Embedded Systems: What is an Embedded System, Embedded Systems design constraints Microcontroller Architecture and Programming Model, Microcontrollers vs Microprocessors, Overview of PIC Microcontroller Family and Architecture Programming Model, PIC Instruction Set, Examples, Interfacing PIC Microcontroller to the outside world: I/O Interfacing basics, PIC GPIO Model, PIC micros and Counters Module, Watchdog Timer Serial Communications basic Serial Ports Module, Interrupt Management, PIC Interrupts Module, PIC Capture-Compare Module, Analog-To-Digital Conversion basic, PIC Analog-To-Digital (A/D) Conversion Module, PIC. I2C Communications Basics, PIC SPI, I2C Module. Examples Model Based Design of Embedded Systems Embedded Systems Design Process, Introduction to model-based design, Context and Use Case diagram, Sequence and Collaboration diagrams, Class and Object Diagrams

## **COURSE OUTLINE (PRACTICAL):**

To acquaint the students with the organization, programming and applications of microprocessor-based systems

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] M. A. Mazidi, AVR Microcontroller and Embedded Systems: Using Assembly and C, latest ed.
- [2] J. W. Valvano, Embedded Systems: Introduction to ARM Cortex-M Microcontrollers, latest ed. CreateSpace Independent Publishing Platform.
- [3] J. W. Valvano, Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, latest ed. CreateSpace Independent Publishing Platform.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| <b>Subject Name</b>        | <b>: Communication Systems</b>                        |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                        |
| <b>Course Code</b>         | <b>: Theory (EE25-315)<br/>: Practical (EE25-316)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                  |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                          |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                     |
| <b>Marks</b>               | <b>: Theory (100)<br/>: Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Engr. Abdul Wahab Khokar</b>                     |

### DESCRIPTION

This course includes the fundamental concepts of analog and digital communication systems and Provide knowledge of various modulation and demodulation techniques. Develop an understanding of signal transmission, noise analysis, and bandwidth considerations. Explain the functioning and design of transmitters and receivers. Familiarize students with modern communication technologies such as wireless communication, satellite systems, and fiber optics. waves, oscillations, electronics and mechanics.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                                                                                   | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | Use theorems such as Parseval's theorem and tools such as Fourier transform to represent and quantify signals in time and frequency domain as well as understand the characteristics of distortion-less communication channel | Cognitive | C3             | 6   | 50    |
|               | 2   | Describe and apply the basic theory, compare advantages and disadvantages, identify and compute parameters, the                                                                                                               | Cognitive | C3             | 9   | 50    |

|  |  |                                                                                                                                            |  |  |  |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|  |  | performance metrics, and explain the working of the different types of analog transceiver designs using time and frequency domain analysis |  |  |  |  |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                                                                            | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Practice</b> various electronic circuits for analog modulation under guidance and demodulation and understand their working in order to apply theory into practice. | Psychomotor | P3             | 5   | 50    |

### **COURSE OUTLINE (THEORY):**

Amplitude Modulation: Baseband and carrier communications, Double Sideband (DSB), Single Sideband (SSB), Vestigial Sideband (VSB), Superheterodyne AM Receiver, Carrier Acquisition, Television, Angle Modulation: Instantaneous frequency, Bandwidth of FM/PM, Generation of FM/PM, Demodulation of FM/PM. Noise: Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems Pulse Modulation: Sampling and Quantization, Pulse Amplitude Modulation, Pulse Position and Pulse Width Modulation, Quantization Noise, Signal to Quantization Noise Ratio, Pulse code Modulation, Delta Modulation, Frequency Shift Keying, Phase Shift Keying.

### **COURSE OUTLINE (PRACTICAL):**

Developing and understanding signal systems and transforms using MATLAB

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] B. P. Lathi and Z. Ding, Modern Digital and Analog Communication Systems, latest ed. Oxford University Press.
- [2] J. G. Proakis and M. Salehi, Fundamentals of Communication Systems, latest ed. Prentice Hall.
- [3] J. G. Proakis and M. Salehi, Digital Communications, latest ed. McGraw Hill.





**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                     |                                               |
|---------------------|-----------------------------------------------|
| <b>Subject Name</b> | <b>: Control System</b>                       |
| Credit Hours        | : 3+1=4                                       |
| Course Code         | : Theory (EE25-317)<br>: Practical (EE25-318) |
| Effective           | : 2K25-BE(E)                                  |
| Pre-Requisites      | : Nil                                         |
| Weeks/Lectures/Labs | : 16/48/16                                    |
| Marks               | : Theory (100)<br>: Practical (50)            |
| Instructor Name     | : Mr. Ghulam Mustafa Shoro                    |

### DESCRIPTION

Provide fundamental knowledge of control system concepts and its applications Provide fundamental knowledge of control system concepts and their mathematical modeling. Teach students how to analyze the dynamic behavior of control systems using time-domain and frequency-domain techniques. Introduce stability analysis and methods to determine the performance of control systems. Develop understanding of feedback principles and their role in improving system performance. Equip students with tools to design basic controllers (e.g., PID) and analyze control system responses. Familiarize students with the application of control systems in electrical, mechanical, and industrial systems

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                            | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|----------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Understand</b> the fundamental concepts of control systems and their applications   | Cognitive | C2             | 1   | 10    |
|               | 2   | <b>Analyze</b> system behavior using time response and transient response techniques.  | Cognitive | C4             | 2   | 54    |
|               | 3   | <b>Design</b> and simulate control systems to improve the energy efficiency and reduce | Cognitive | C6             | 6   | 12    |



|  |   |                                                                                                                                        |           |    |   |    |
|--|---|----------------------------------------------------------------------------------------------------------------------------------------|-----------|----|---|----|
|  |   | environmental impact in industrial applications.                                                                                       |           |    |   |    |
|  | 4 | <b>Evaluate</b> control system performance and propose improvements, also evaluate the intellectual property and ethical design issues | Cognitive | C5 | 7 | 24 |

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                                   | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|-------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Demonstrate</b> Proficiency in Laboratory Techniques and Equipment                                                         | Psychomotor | P4             | 1   | 15    |
|                  | 2   | <b>Perform</b> Experiments and Analyze Data                                                                                   | Psychomotor | P5             | 2   | 15    |
|                  | 3   | <b>Integrate,</b> test, and troubleshoot a control-system setup to achieve specified performance under laboratory conditions. | Psychomotor | P6             | 3   | 20    |

### **COURSE OUTLINE (THEORY):**

Introduction to control systems; open-loop and closed-loop systems, transfer functions, block diagrams, signal flow graphs; introduction to modeling; formation of differential equations of electrical, mechanical and other systems, transfer functions; performance analysis of closed-loop system; stability, Routh's stability criterion, types and analysis of feedback control systems; root locus, Bode plots, polar plots, Nyquist stability criterion, gain and phase margins, Nichol's chart; steady-state and transient response of first-order, second-order and higher-order systems; introduction to state-space concepts and design techniques, formation and solution of state equations, eigenvalues and eigenvectors, transfer function matrices; Controller design using frequency response and root locus methods.

### **COURSE OUTLINE (PRACTICAL):**

Familiarization with MATLAB Control System toolbox and MATLAB/SIMULINK tool box; Modeling and simulation of armature-controlled and field-controlled DC motors, simulation of step response and impulse response with unity feedback using MATLAB; system analysis using root locus, Bode plot, and Nyquist plot using MATLAB; PI, PD and PID controller design, analysis of servo system and higher order systems

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] N. S. Nise, Control Systems Engineering, latest ed.
- [2] R. C. Dorf and R. H. Bishop, Modern Control Systems, latest ed.

## **Third Year - Sixth Semester**



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                     |                             |
|---------------------|-----------------------------|
| <b>Subject Name</b> | <b>: Expository Writing</b> |
| Credit Hours        | : 2+0=2                     |
| Effective           | : 2K25-BE(EE)               |
| Pre-Requisites      | : Nil                       |
| Weeks/Lectures/Labs | : 16/32                     |
| Marks               | : Theory (50)               |
| Instructor Name     | : Mr. Israr Khoso           |

### DESCRIPTION

This course includes the basic concepts of effective expository writing (clarity, coherence and organization) and paragraph writing. Understanding Expository Writing (definition, types, purpose, and applications) and Characteristics of effective expository writing (clarity, coherence and organization).

#### Mapping of SDGs

|                          |                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.7: ..... ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles... |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                    | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Apply</b> the essentials of writing process integrating pre-writing, drafting, editing and proof reading to produce well-structured essays. | Cognitive | C3             | 9   | 20    |
|               | 2   | <b>Demonstrate</b> mastery of diverse expository type to address different purposes and audiences.                                             | Cognitive | C4             | 10  | 20    |
|               | 3   | <b>Evaluate</b> ethical practices to maintain originality in expository writing.                                                               | Cognitive | C5             | 11  | 10    |

### COURSE OUTLINE (THEORY):

Expository Writing is a sequential undergraduate course aimed at refining writing skills in various contexts. Building upon the foundation of pre-requisite course, Functional English, this course will enhance students' abilities of producing clear, concise, and coherent written texts in English. This course will also enable students to dissect intricate ideas to amalgamate

information and to express their views and opinion through well-organized essays. The students will further be able to refine their analytical skills to substantiate their viewpoints using credible sources while adhering to established ethical writing norms. Additionally, the course will highlight the significance of critical thinking enabling students to produce original and engaging written texts.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] R. B. Axelrod and C. R. Cooper, *The St. Martin's Guide to Writing*, latest ed.
- [2] G. Graff and C. Birkenstein, *They Say / I Say: The Moves That Matter in Academic Writing*, latest ed.
- [3] D. Rosenwasser and J. Stephen, *Writing Analytically*, latest ed.
- [4] J. M. Williams and J. Bizup, *Style: Lessons in Clarity and Grace*, latest ed.
- [5] W. Strunk Jr. and E. B. White, *The Elements of Style*, latest ed.



**Department of Electronic Engineering  
Faculty of Engineering and Technology  
University of Sindh, Jamshoro**



|                            |                                                       |
|----------------------------|-------------------------------------------------------|
| <b>Subject Name</b>        | <b>: Computer Communication and Networks</b>          |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                        |
| <b>Course Code</b>         | <b>: Theory (MDE25-321)<br/>Practical (MDE25-322)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                  |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                          |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                     |
| <b>Marks</b>               | <b>: Theory (100)<br/>Practical (50)</b>              |
| <b>Instructor Name</b>     | <b>: Engr. Saeed Rattar</b>                           |

### DESCRIPTION

Computer Communication and Networks involve the exchange of data between devices using communication protocols. A computer network connects devices (like computers, routers, and servers) to share resources and information efficiently. Networks are classified by size and scope—such as LAN, WAN, and MAN—and are structured using topologies like star, ring, or mesh. Communication is governed by protocols like TCP/IP, which ensure reliable data transfer. These networks enable internet access, cloud computing, remote work, and modern applications like IoT and video streaming, making them essential to today's digital world.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Understand</b> and explain the fundamentals of computer communication networks, including the OSI and TCP/IP models, protocols, and network topologies. | Cognitive | C2             | 3   | 40    |
|               | 2   | <b>Analyze</b> the performance of communication networks by applying concepts of bandwidth,                                                                | Cognitive | C4             | 4   | 40    |

|  |   |                                                                                                                                                                            |           |    |   |    |
|--|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|---|----|
|  |   | latency, throughput, and packet loss in different network environments                                                                                                     |           |    |   |    |
|  | 3 | <b>Evaluate</b> and troubleshoot common network issues, such as congestion, routing problems, and data packet transmission errors, using appropriate tools and techniques. | Cognitive | C5 | 8 | 20 |

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                                       | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Configure</b> , implement, and test basic communication networks using appropriate devices, addressing schemes, and protocols. | Psychomotor | P4             | 5   | 50    |

### **COURSE OUTLINE (THEORY):**

Overview of Communication System, Communication Model, Nodes. Links. Protocol. Network Edge (Client, Server). Network Fundamentals, Types of Networks (LAN, MAN, WAN), Network Topologies. (Bus. Star, Tree, Ring, Mesh), Logical versus Physical Topology. Network Interface Controller, Repeaters, Hubs, Bridges, Switches. Routers, Gateway. Access Networks, Core Networks, Internet. Intranet. Concept of Packet, Packet Forwarding/Switching, Store-and-Forward, Transmission. Transmission Delay, Propagation Delay, Queueing Delay. Physical Media. Coaxial (10Base-2, 10Base-5). Coaxial Cable Connectors. Ethernet (10Base-T, 100Base-TX, 1000Base-T), Twisted-Pair Connectors, Fiber Optic (10Base-F. 100Base-FX. 1000Base-LX. 1000Base-SX), Fiber- Optic Connectors. Serial (RS-232 and RS-422). Architecture and Protocols, Layered Models (TCP/IP, OSI), Encapsulation/Decapsulation; Link Layer, Services Provided by the Link Layer. Error-Detection and -Correction Techniques (Parity Checks. Check summing Methods). Multiple Access Links and Protocols. Channel Partitioning Protocols (FDM. TDM). Random Access Protocols (Slotted ALOHA. Pure ALOHA. CSMA/CD. CSMA/CA). Taking-Turns Protocols (Polling Protocol. Token-Passing Protocol). Switched Local Area Networks (Collision Domain. ICMP, and ARP).Self-learning of Switch Table Properties of Link-Layer Switching Spanning Tree Protocol (STP)Virtual Local Area Networks (VLANs),Ethernet Framing, Frame Formats (Ethernet II versus IEEE 802.3).

Media Access Control (MAC) Addressing, Frame Forwarding and Filtering (Unicast. Broadcast, Multicast), Frame Processing (Source MAC. Destination MAC, Type Field. Data. FCS), IP Addressing, IP Packet Header and IP Addressing (Network Part. Host Part). Network Address. Broadcast Address. IP Address Classes (A. B. C. D. E). Subnet Mask. VLSM.IP Addressing Limitations. Dynamic Host Configuration Protocol (DHCP). Network Layer, Forwarding and Routing. Virtual Circuit and Datagram Networks. IP routing tasks. Routing Decision (Preference. Metric). Static Routing (Application, Behavior, Limitations). Routing Algorithms (Distance-Vector Routing Algorithm. Link-State Routing Algorithm). Dijkstra's Algorithm. Transport Layer Protocols, Transmission Control Protocol (TCP), TCP Ports, TCP

Header, TCP Connection Establishment Termination. Go-Back-N (GBN), Selective Repeat (SR), User Datagram Protocol (UDP), UDP Datagram Format. UDP Forwarding Behavior, Principles of Congestion Control, TCP Congestion Control (Slow Start, Congestion Avoidance, Fast Recovery), Application Layer Protocols. The Web and HTTP, HTTP Message Format, Cookies, File Transfer: FTP, Overview of How DNS Works.

### **COURSE OUTLINE (PRACTICAL):**

Introduction to Networking, Networking Media, Topology Orientation and Building a Small Network Introduction to Switch & Its Basic Configurations Basic VLAN Configuration, Introduction to Router & Its Basic Configurations Static Routing Using Wireshark to view Protocol Data Units Dynamic Routing using RIP and EIGRP, Dynamic Routing using OSPF Basic DHCP and NAT Configuration Basic Inter-VLAN Routing IPv6 Configurations

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] W. Stallings, Data and Computer Communications, latest ed. Pearson.
- [2] J. F. Kurose and K. W. Ross, Computer Networking: A Top-Down Approach, latest ed. Pearson.
- [3] A. S. Tanenbaum and D. J. Wetherall, Computer Networks, latest ed. Pearson.



**Department of Electronic Engineering**  
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**University of Sindh, Jamshoro**



|                            |                                   |
|----------------------------|-----------------------------------|
| <b>Subject Name</b>        | <b>: Power Electronics</b>        |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                    |
| <b>Course Code</b>         | <b>: Theory (EE25-323)</b>        |
|                            | <b>: Practical (EE25-324)</b>     |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>              |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                      |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                 |
| <b>Marks</b>               | <b>: Theory (100)</b>             |
|                            | <b>: Practical (50)</b>           |
| <b>Instructor Name</b>     | <b>: Mr. Ghulam Mustafa Shoro</b> |

### **DESCRIPTION**

This course includes the basic concepts of power electronic devices and their applications. To teach students the fundamental concepts of power electronics. To teach students about switching and power losses and converters.

#### **Mapping of SDGs**

|                                    |                                                                                                                                                                                         |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education           | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
| SDG 7: Affordable and clean energy | 7.b: ..... expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries...                                         |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                         | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|----------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Understanding</b> of Power Semiconductor Devices and Circuits           | Cognitive     | C2                    | 1          | 10           |
|               | 2          | <b>Analyze</b> Power Conversion System and Circuits                        | Cognitive     | C4                    | 2          | 30           |
|               | 3          | <b>Design</b> Power Electronics Systems and Circuits                       | Cognitive     | C6                    | 3          | 30           |
|               | 4          | <b>Evaluate</b> the performance and efficiency of Power Electronics System | Cognitive     | C5                    | 4          | 30           |



## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                   | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|---------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Demonstrate</b> Proficiency in Laboratory Techniques and Equipment                                         | Psychomotor | P4             | 1   | 15    |
|                  | 2   | <b>Perform</b> Experiments and Analyze Data                                                                   | Psychomotor | P5             | 2   | 15    |
|                  | 3   | <b>Integrate,</b> test, and troubleshoot a power-electronic converter to meet specified operating conditions. | Psychomotor | P6             | 3   | 20    |

## **COURSE OUTLINE (THEORY)**

Introduction to power electronics; solid-state devices used in power electronics: power diode, power BJT, power MOSFET, SCR, GTO, IGBT, TRIAC, DIAC; on-state and switching power losses; semi-controlled, fully-controlled and uncontrolled rectifiers: single-phase and three-phase, six-pulse, twelve-pulse and twenty-four pulse rectifiers; DC-DC converters; Buck, Boost and Buck-Boost converters, single-phase and three-phase inverters; pulse-width-modulated (PWM) inverters, AC controllers, switched mode power supplies, Fundamentals of AC and DC motor drives.

## **COURSE OUTLINE (PRACTICAL):**

Design of converters; single-phase and three-phase uncontrolled, half-controlled and fully controlled rectifiers; buck, boost and polarity inverting converters; flyback converter; PWM Inverters.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] R. W. Erickson and D. Maksimović, Fundamentals of Power Electronics, latest ed. Springer.
- [2] M. H. Rashid, Power Electronics: Circuits, Devices & Applications, latest ed. Prentice Hall.
- [3] N. Mohan, W. P. Robbins, and T. M. Undeland, Power Electronics: Converters, Applications and Design, latest ed. John Wiley & Sons.
- [4] D. W. Hart, Power Electronics, latest ed. McGraw-Hill.
- [5] L. Umanand, Power Electronics: Essentials and Applications, latest ed. Wiley.
- [6] M. S. Jamil Asghar, Power Electronics: Devices, Circuits, and Applications, latest ed. Springer.



**Department of Electronic Engineering**  
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**University of Sindh, Jamshoro**



|                            |                                        |
|----------------------------|----------------------------------------|
| <b>Subject Name</b>        | <b>: Electrical Machines</b>           |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                         |
| <b>Course Code</b>         | <b>: Theory (EE25-325)</b>             |
|                            | <b>: Practical (EE25-326)</b>          |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>                    |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                           |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                      |
| <b>Marks</b>               | <b>: Theory (100)</b>                  |
|                            | <b>: Practical (50)</b>                |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Aamir Hussain Memon</b> |

### **DESCRIPTION**

The subject Electrical Machines is fundamental in electrical and electronics engineering. It covers the principles, design, operation, and applications of machines that convert electrical energy to mechanical energy and vice versa.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: ..... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                             | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|--------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Understand</b> the electromechanical energy conversion concepts, working and construction of AC and DC electrical machines. | Cognitive     | C2                    | 1          | 40           |
|               | 2          | <b>Explain</b> AC and DC generators and motors with their types and performance.                                               | Cognitive     | C2                    | 2          | 40           |
|               | 3          | <b>Analyse</b> the working principle, performance and construction of transformers.                                            | Cognitive     | C4                    | 4          | 20           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Perform</b> laboratory experiments on AC and DC machines and transformers under guidance, and evaluate their operating characteristics. | Psychomotor | P3             | 5   | 50    |

## **COURSE OUTLINE (THEORY)**

Magnetic circuits and calculations: Single-phase and polyphase circuits. Transformers: Principle of operation, construction, types, EMF equation and transformation ratio, equivalent values and equivalent power circuit diagram, impedance matching, operation and phasor diagram with and without load, measurement of losses and efficiency, parallel operation, cooling, three-phase connections, instrumentation transformers; DC machines: Construction, types, armature reaction, no load and on voltage characteristics of series, shunt generators, division of loads in parallel operation, torque speed characteristics, measurement of losses and efficiency. AC machines: AC machine armature winding, three-phase windings, MMF of distributed windings, speed and direction of rotating magnetic field. Induction motor: Types, construction, principle of operation, induced EMF, relation between stator and rotor quantities, phasor diagram, equivalent circuit diagram, torque slip power relations. Synchronous generator. Brushless DC motor. Switched-reluctance motor. Stepper motor.

## **COURSE OUTLINE (PRACTICAL):**

Characteristics of DC series and shunt motors, DC series and shunt generators, AC induction motor, synchronous generator, induction generator, universal motor, brushless DC motor and switched reluctance motor; transformer theory and testing.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] S. J. Chapman, Electric Machinery Fundamentals, latest ed. McGraw-Hill.
- [2] A. E. Fitzgerald, C. Kingsley Jr., and S. D. Umans, Electric Machinery, latest ed. McGraw-Hill.
- [3] J. Hindmarsh, Electrical Machines, latest ed. McGraw-Hill.
- [4] T. Wildi, Electrical Machines, Drives, and Power Systems, latest ed. Pearson.



**Department of Electronic Engineering  
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|                     |                                               |
|---------------------|-----------------------------------------------|
| Subject Name        | : Digital Signal Processing                   |
| Credit Hours        | : 3+1=4                                       |
| Course Code         | : Theory (EE25-327)<br>: Practical (EE25-328) |
| Effective           | : 2K25-BE(EE)                                 |
| Pre-Requisites      | : Nil                                         |
| Weeks/Lectures/Labs | : 16/48/16                                    |
| Marks               | : Theory (100)<br>: Practical (50)            |
| Instructor Name     | : Engr. Dr. Beenish Ansari                    |

### DESCRIPTION

This course includes the basic concepts physical and mathematical significance of digital signal processing from theoretical and application perspective and their applications.

### **Mapping of SDGs**

|                          |                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 4: Quality education | 4.4: .... substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|        | CLO | Description                                                                                                                                    | Domain    | Taxonomy level | PLO | Marks |
|--------|-----|------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| Theory | 1   | <b>Explain</b> the fundamental concepts, properties of discrete-time signals and systems in time-domain, and perform various signal operations | Cognitive | C2             | 6   | 30    |
|        | 2   | <b>Apply</b> and Solve signals and systems problems in time, frequency, and complex frequency domain.                                          | Cognitive | C3             | 9   | 50    |
|        | 3   | <b>Analyze</b> and develop discrete-time systems, including filters design, with appropriate properties and windowing methods                  | Cognitive | C4             | 11  | 20    |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | <b>CLO</b> | <b>Description</b>                                                          | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|------------------|------------|-----------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Practical</b> | 1          | <b>Practice</b> the design of FIR and IIR filters in Matlab under guidance. | Psychomotor   | P3                    | 5          | 50           |

## **COURSE OUTLINE (THEORY):**

The purpose of this course is to develop physical and mathematical significance of Digital Signal Processing from theoretical, application and implementation perspectives. The topics include a quick review of Discrete-Time signals and systems, z-transform and Discrete-Time Fourier transform (DTFT) and bandlimited sampling. An introduction to multirate systems will then be covered with some applications. Discrete Fourier Transform (DFT) is then introduced as a practical spectral analysis tool followed by algorithms for efficient computation of DFT (such as FFT and Goertzel Algorithm). A good portion of the course focuses on the frequency domain analysis of systems and the structures for system implementation. Different techniques for filter design against given specifications are then introduced with their practical significance.

## **COURSE OUTLINE (PRACTICAL):**

Understanding the concept of designing of the filters in MATLAB, different transformation techniques of discrete signals.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, latest ed. Pearson Education.
- [2] E. C. Ifeachor and B. W. Jervis, Digital Signal Processing: A Practical Approach, latest ed. Pearson Education.
- [3] K. Deergha Rao, Digital Signal Processing: Theory and Practice, latest ed. Pearson Education.
- [4] A. V. Oppenheim and R. W. Schaffer, Discrete-Time Signal Processing, latest ed. Pearson Education.

## **Fourth Year - Seventh Semester**



**Department of Electronic Engineering**  
**Faculty of Engineering and Technology**  
**University of Sindh, Jamshoro**



|                            |                                   |
|----------------------------|-----------------------------------|
| <b>Subject Name</b>        | <b>: Renewable Energy Systems</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                    |
| <b>Course Code</b>         | <b>: Theory (EE25-410)</b>        |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>               |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                      |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                    |
| <b>Marks</b>               | <b>: Theory (50)</b>              |
| <b>Instructor Name</b>     | <b>: Mr. Ghulam Mustafa</b>       |

### DESCRIPTION

By studying Renewable Energy Systems, students can gain a deep understanding of the complex relationships between energy, environment, and society, and develop the skills and knowledge needed to design, implement, and manage sustainable energy systems that meet the needs of present and future generations.

#### **Mapping of SDGs**

|                                            |                                                                                                                                                                                        |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 7: Affordable and clean energy         | 7.b: ... expand infrastructure...                                                                                                                                                      |
| SDG 11: Sustainable cities and communities | 11.5: ... reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses ..... by disasters, including water-related disasters... |
| SDG 13: Climate action                     | 13.1: Strengthen resilience and adaptive capacity to climate related hazards and natural disasters...                                                                                  |

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                 | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Compute</b> the effects of renewable energy systems on local communities, including their social, economic, and environmental impacts    | Cognitive | C3             | 6   | 20    |
|               | 2   | <b>Analyze</b> a renewable energy system for a specific community or industry, taking into account technical, economic, and social factors. | Cognitive | C4             | 9   | 20    |
|               | 3   | <b>Evaluate</b> a comprehensive plan for integrating renewable energy systems into existing energy                                          | Cognitive | C5             | 11  | 10    |

|  |  |                                                                                               |  |  |  |  |
|--|--|-----------------------------------------------------------------------------------------------|--|--|--|--|
|  |  | infrastructure, including strategies for overcoming technical, economic, and social barriers. |  |  |  |  |
|--|--|-----------------------------------------------------------------------------------------------|--|--|--|--|

### **COURSE OUTLINE (THEORY):**

Present day fuel use, Energy Problems of modern societies, Renewable Energy Sources as a solution, Solar Thermal Energy, Nature and availability of solar radiation. Low temperature solar energy applications, Solar thermal engines and electricity generation, Economics Potential and environmental impact, Solar Photovoltaic, Historical Background. PV in Silicon. Reducing the cost of crystalline PV cells, Thin film PV. Other innovative PV technologies, Electrical characteristics of Silicon PV cells and modules, PV systems for remote power, Grid-connected PV systems. Economics of PV Energy Systems, Environmental Impact and Safe Fuel Cells, Thermodynamic principles, Efficiency of fuel cell factors limiting the performance, Design, new development in fuel cells, Possibility of future use in Electric vehicles., Bio Mas Introduction, Past and present. Bio Mass as a fuel, Extracting the energy. Agricultural residues, Energy crops. Environmental benefits and impacts. Economics, New Technologies, Future Prospects. Wind Energy, wind turbine types and terms, Aerodynamics of wind turbines. Mechanical power, Wind turbine generators, power and energy from wind turbines, Wind speed characteristics of a site, Economics of wind turbine, Commercial development and wind energy potential. Tidal Power, Tidal energy harnessing schemes, Tidal barrages, Geothermal Energy, Scope, advantages and issues.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] G. Boyle, Renewable Energy and Power for a Sustainable Future, latest ed. Oxford University Press.
- [2] J. Twidell and T. Weir, Renewable Energy Resources, latest ed. Taylor & Francis.
- [3] A. V. da Rosa, Fundamentals of Renewable Energy Processes, latest ed. Academic Press.





**Department of Electronic Engineering**  
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**University of Sindh, Jamshoro**



|                            |                                  |
|----------------------------|----------------------------------|
| <b>Subject Name</b>        | <b>: Artificial Intelligence</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                   |
| <b>Course Code</b>         | <b>: Theory (EE25-411)</b>       |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>              |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                     |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                   |
| <b>Marks</b>               | <b>: Theory (50)</b>             |
| <b>Instructor Name</b>     | <b>: Dr. Shahnawaz Shah</b>      |

### **DESCRIPTION:**

This course will introduce to the students the application areas of artificial intelligence (AI), the techniques and tools used in writing AI applications. In particular, the students will learn to structure a real-world problem as an AI problem, apply the appropriate techniques and tools to solve the problem. The students will be taught Prolog language and its use in representing and solving a logical system. Application of AI techniques such as state space search, heuristic search, optimization techniques, game programming, expert system development, natural language processing, and machine learning will be covered in detail. The students will be given extensive programming exercises to provide them opportunity to practice their classroom skills.

### **Mapping of SDGs**

|                                    |                                                                                                                    |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation         | 9.5: ..... encouraging innovation and substantially increasing the number of research and development workers..... |
| SDG 17: Partnerships for the goals | 17.17: ..... effective public, public private and civil society partnerships.....                                  |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                   | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|----------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> artificial intelligence, its characteristics and its application areas.                               | Cognitive     | C2                    | 2          | 15           |
|               | 2          | <b>Select</b> and <b>apply</b> appropriate algorithms and AI techniques to solve complex problems                    | Cognitive     | C3                    | 3          | 15           |
|               | 3          | <b>Analyze</b> real-world problems as state space problems, optimization problems or constraint satisfaction problem | Cognitive     | C4                    | 4          | 20           |

### **COURSE OUTLINE (THEORY):**

Introduction to AI and Machine learning, Linear regression, Logistic regression, Gradient Descent Method, Polynomial Regression Regularization, Classification Evaluation, Naïve Bayes, Decision Tree, Neural Networks, Clustering, Debugging the ML models, Search-algorithms, informed search, Game playing, propositional Logic, First Order Predicate Logic, Constraint satisfaction, conclusion & Future of AI.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, latest ed.
- [2] G. F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, latest ed. Addison-Wesley.
- [3] S. J. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, latest ed. Prentice-Hall



**Department of Electronic Engineering  
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University of Sindh, Jamshoro**



|                            |                                          |
|----------------------------|------------------------------------------|
| <b>Subject Name</b>        | <b>: Civics and Community Engagement</b> |
| <b>Credit Hours</b>        | <b>: 2+0=2</b>                           |
| <b>Course Code</b>         | <b>: Theory (HUM25-412)</b>              |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>                      |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                             |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/32</b>                           |
| <b>Marks</b>               | <b>: Theory (50)</b>                     |
| <b>Instructor Name</b>     | <b>: Dr. Niaz Bhutto</b>                 |

### **DESCRIPTION:**

This course is designed to provide students with a deep understanding of Civics and community engagement. The course will explore the foundations of civic life, including the principles of democracy, the role of the government, and the responsibilities of citizenship. Additionally, the course will provide students with an opportunity to develop skills in community engagement, including community organizing, advocacy, and social justice.

### **Mapping of SDGs**

|                                   |                                                                                                                                                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 3: Good health and well-being | 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks. |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                                                                                                 | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Apply</b> skills in community engagement, including community organizing, advocacy, and social justice, with an emphasis on gender sensitivity, inclusivity, and equitable participation of all genders in community processes. | Cognitive     | C3                    | 8          | 10           |
|               | 2          | <b>Analyze</b> the role of community organizations and civic institutions in promoting civic responsibility, including their approaches to gender equity, women's empowerment, and gender-responsive governance.                   | Cognitive     | C4                    | 7          | 25           |

|  |   |                                                                                                                                                                                                                                                 |           |    |    |    |
|--|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|----|----|
|  | 3 | <b>Analyze</b> non-profit and community-based organizations and evaluate their role in community engagement, focusing on gender-sensitive policies, inclusive program design, and the promotion of social justice across diverse gender groups. | Cognitive | C4 | 11 | 15 |
|--|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|----|----|

### **COURSE OUTLINE (THEORY):**

Introduction to Civics and Citizenship, definition of civics, citizenship, and civic engagement, Historical evolution of civic participation, Types of citizenship: active, participatory, digital, etc., The relationship between democracy and citizenship, Civics and Citizenship, Concepts of civics, citizenship, and civic engagement, Foundations of modern society and citizenship, Types of citizenship: active, participatory, digital, etc, State, government and Civil Society, Structure and functions of government in Pakistan, The relationship between democracy and civil society, Right to vote and importance of political participation and representation, Right and Responsibilities, Overview of fundamental rights and liberties of citizens under Constitution of Pakistan 1973, Civic responsibilities and duties, Ethical considerations in civic engagement (accountability, non-violence, peaceful dialogue, civility, etc.), Community Engagement, Concept, nature and characteristics of community, Community development and social cohesion, Approaches to effective community engagement, Case studies of successful community driven initiatives, Advocacy and Activism, Public discourse and public opinion, Role of advocacy in addressing social issues, Social action movements, Digital Citizenship and Technology, The use of digital platforms for civic engagement, Cyber ethics and responsible use of social media, Digital divides and responsible (access, usage, socioeconomic, geographic, etc.) and their impacts on citizenship, Diversity, Inclusion and Social Justice, Understanding diversity in society (ethnic, cultural, economic, political etc.), Youth, women and minorities' engagement in social development., Addressing social inequalities and injustices in Pakistan, Promoting inclusive citizenship and equal rights for societal harmony and peaceful coexistence.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] Civics Today: Citizenship, Economics & You, latest ed. McGraw-Hill Education.
- [2] J. Kloppenburg, Community Organizing: Theory and Practice, latest ed.



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|                            |                                     |
|----------------------------|-------------------------------------|
| <b>Subject Name</b>        | <b>: Robotic Engineering</b>        |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                      |
| <b>Course Code</b>         | <b>: Theory (EE25-413)</b>          |
|                            | <b>: Practical (EE25-414)</b>       |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>                 |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                        |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                   |
| <b>Marks</b>               | <b>: Theory (100)</b>               |
|                            | <b>: Practical (50)</b>             |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Zain Anwar Memon</b> |

### **DESCRIPTION:**

This course provides an overview of robot mechanisms, dynamics, and intelligent controls. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors; wireless networking

### **Mapping of SDGs**

|                                        |                                                                                                           |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|
| SDG 8: Decent work and economic growth | 8.3: ..... decent job creation, entrepreneurship.....                                                     |
| SDG 9: Industry innovation             | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes..... |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                     | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|--------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Explain</b> the necessary ingredients of robotic systems ranging from basic to the state of the art | Cognitive     | C2                    | 6          | 50           |
|               | 2          | <b>Analyze</b> the forward and inverse kinematics of robotic manipulators.                             | Cognitive     | C4                    | 9          | 50           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                                                                                                    | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | <b>Demonstrate</b> the kinematics and dynamics of a multi-degree-of-freedom manipulator and implement position controllers in MATLAB/Simulink. | Psychomotor | P4             | 5   | 50    |

## **COURSE OUTLINE (THEORY):**

Introduction to Robotics: Fundamentals, Classification of Robots, Advantages vs Disadvantages of Robots, Components of a robot, Robots degrees of freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Robot Languages. Robot Kinematics: Position Analysis, Forward Kinematics, Inverse Kinematics, Robots As Mechanism, Matrix Representation, Homogeneous Transformation Matrices, Representation of Transformations, Inverse of Transformation Matrices, Forward And Inverse Kinematics of Robots, Denavit-Hartenberg Representation of Forward Kinematic Equations of Robot, Inverse Kinematic Program of Robots, Degeneracy And Dexterity. Dynamic Analysis and Forces: Lagrangian Mechanics. Trajectory Planning: Path vs. Trajectory, Joint-Space vs. Cartesian-Space Descriptions, Basics of Trajectory Planning, Joint-Space Trajectory Planning. Sensors and Actuators in Robotic.

## **COURSE OUTLINE (PRACTICAL):**

Experiments to introduce the students to basic robotics and programming of programmable devices used in the robotics field.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] J. J. Craig, Introduction to Robotics: Mechanics and Control, latest ed. Prentice Hall.
- [2] S. B. Niku, Introduction to Robotics: Analysis, Control, Applications, latest ed. Wiley.
- [3] J. L. Fuller, Robotics: Introduction, Programming, and Projects, latest ed. Prentice Hall.
- [4] M. W. Spong and M. Vidyasagar, Robot Dynamics and Control, latest ed. John Wiley & Sons.
- [5] M. W. Spong and S. Hutchinson, Robot Modeling and Control, latest ed. John Wiley & Sons



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|                            |                               |
|----------------------------|-------------------------------|
| <b>Subject Name</b>        | <b>: Embedded Systems</b>     |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                |
| <b>Course Code</b>         | <b>: Theory (EE25-415)</b>    |
|                            | <b>: Practical (EE25-416)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>           |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                  |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>             |
| <b>Marks</b>               | <b>: Theory (100)</b>         |
|                            | <b>: Practical (50)</b>       |
| <b>Instructor Name</b>     | <b>: Engr. Abdul Manan</b>    |

### **DESCRIPTION:**

In today's world, embedded systems are everywhere homes, offices, cars, factories, hospitals, planes and consumer electronics. Their huge numbers and new complexity call for a new design approach, one that emphasizes high-level tools and hardware/software tradeoffs, rather than low-level assembly-language programming and logic design. This course presents the traditionally distinct fields of software and hardware design in a new unified approach. It covers trends and challenges, introduces the design and use of single-purpose processors ("hardware") and general-purpose processors ("software"), describes memories and buses, and illustrates hardware/software tradeoffs, chip technologies, and modern design tools.

### **Mapping of SDGs**

|                                            |                                                                                                           |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| SDG 9: Industry innovation                 | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes..... |
| SDG 11: Sustainable cities and communities | 11.6: ..... special attention to air quality and municipal and other waste management.....                |

### **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                                | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Describe</b> the basic concepts of the Embedded System Design and shall be able to differentiate between the hardware and software viewpoints. | Cognitive     | C2                    | 3          | 50           |
|               | 2          | <b>Analyze</b> the various design techniques for single-purpose,                                                                                  | Cognitive     | C4                    | 4          | 50           |



|  |  |                                                        |  |  |  |  |
|--|--|--------------------------------------------------------|--|--|--|--|
|  |  | general purpose and standard single purpose processors |  |  |  |  |
|--|--|--------------------------------------------------------|--|--|--|--|

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|           | CLO | Description                                                             | Domain      | Taxonomy level | PLO | Marks |
|-----------|-----|-------------------------------------------------------------------------|-------------|----------------|-----|-------|
| Practical | 1   | Troubleshoot and debug embedded systems to identify and resolve issues. | Psychomotor | P4             | 4   | 50    |

:

### **COURSE OUTLINE (THEORY):**

Introduction to Embedded Systems, what is an Embedded System. Embedded Systems design constraints Microcontroller Architecture and Programming Model, Microcontrollers vs Microprocessors, Overview of PIC Microcontroller Family and Architecture Programming Model, PIC Instruction Set, Examples, Interfacing PIC Microcontroller to the outside world. I/O Interfacing Basics, PIC GPIO Module, PIC Timers and Counters Module, Watchdog Timer • Serial Communications Basics, PIC Serial Ports Module, Interrupt Management Interrupts Module, PIC Capture-Compare Module, Analog-To-Digital Conversion Basics, PIC Analog-To-Digital (A/D) Conversion Module, SPI, I2C Communications Basics, PIC SPI, I2C Module, Examples, Model Based Design of Embedded Systems, Embedded Systems Design Process, Introduction to model-based design, Context and Use Case diagrams, Sequence and Collaboration diagrams, Class and Object Diagrams, State charts.

### **COURSE OUTLINE (PRACTICAL):**

8051 Microcontroller, PWM generation using AVR Microcontroller, Implementation of a Calculator with PIC Microcontroller, Keypad and Alphanumeric LCD, Serial Communication with PIC Controller, Analog to Digital Conversion using PIC Controller, Graphics on Microblaze, Analysis and Verification project.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] F. Vahid and T. Givargis, Embedded System Design: A Unified Hardware/Software Introduction, latest ed.
- [2] E. A. Lee and S. A. Seshia, Introduction to Embedded Systems: A Cyber-Physical Systems Approach, latest ed.
- [3] P. P. Chu, RTL Hardware Design Using VHDL: Coding for Efficiency, Portability, and Scalability, latest ed. Wiley-IEEE Press.



## **Fourth Year - Eighth Semester**



**Department of Electronic Engineering  
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**Subject Name** : **Entrepreneurship**  
**Credit Hours** : 3+0=3  
**Course Code** : Theory (MS25-420)  
**Effective** : 2K25-BE(EE)  
**Pre-Requisites** : Nil  
**Weeks/Lectures/Labs** : 16/48  
**Marks** : Theory (100)  
**Instructor Name** : Engr. Aunsa Shah

**DESCRIPTION**

This course is designed to promote entrepreneurial spirit and outlook among students, encouraging them to think critically, identify opportunities, and transform their ideas into successful ventures. It aims at imparting them with the requisite knowledge; skills and abilities, enabling them to seize the identified opportunities for initiating ventures and successfully navigating the challenges that come with starting a business and managing it. The course covers topics relevant to entrepreneurship including setting up and initiation of business (including requirements for registration and incorporation with regulators such as SECP and others), market research, opportunity identification, business planning, financial literacy for managing finances and securing funding, marketing and sales, team building and innovation. Overall, the course is geared towards personal growth and professional development for pursuing innovative- ideas, availing opportunities and initiating start-ups.

**Mapping of SDGs**

|                    |                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 1: No Poverty  | 1.4: ..... ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.                                  |
| SDG 2: Zero hunger | 2.3: .... double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment. |

## **COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|        | CLO | Description                                                                                                                                                       | Domain    | Taxonomy level | PLO | Marks |
|--------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| Theory | 1   | <b>Defend</b> a business plan with an appropriate business model                                                                                                  | Cognitive | C5             | 11  | 40    |
|        | 2   | Formulate the ability to provide self-analysis in the context of an entrepreneurial career, incorporating project management and financial decision-making skills | Affective | A4             | 10  | 44    |
|        | 3   | <b>Express</b> the ability to find an attractive market that can be reached economically.                                                                         | Affective | A3             | 6   | 16    |

## **COURSE OUTLINE (THEORY):**

Introduction to Entrepreneurship, Definition and concept of entrepreneurship, why to become an entrepreneur? Entrepreneurial process, Role of entrepreneurship in economic development, Entrepreneurial Skills, Characteristics and qualities of successful entrepreneurs (including stories of successes and failures), Areas of essential entrepreneurial skills and ability areas such as creative and critical thinking, innovation and Risk taking. Opportunity Recognition and Idea generation, Marketing and Sales, Financial Literacy, Basic concepts of income, savings, investments, Basic concepts of assets, liabilities and equity, Basic concepts of revenue and expenses, overview of cash flows, Overview of banking products including Islamic modes of financing, Sources of funding for startups (angel financing, debt financing, equity financing etc.) Team building for startups, characteristics and features of effective Teams, Regulatory requirements to Establish Enterprises in Pakistan, Types of enterprises (e.g., sole proprietorship; partnership; private limited companies etc), Intellectual property rights and protection, Regulatory requirements to register an enterprise in Pakistan, with special emphasis on export firms, Taxation and financial reporting obligation

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] P. Burns and J. Dewhurst, Small Business and Entrepreneurship, latest ed.
- [2] P. N. Singh, Entrepreneurship for Economic Growth, latest ed.
- [3] P. F. Drucker, Innovation and Entrepreneurship, latest ed.



**Department of Electronic Engineering  
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|                            |                                                     |
|----------------------------|-----------------------------------------------------|
| <b>Subject Name</b>        | <b>: FPGA-Based Digital System Design</b>           |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                                      |
| <b>Course Code</b>         | <b>: Theory (EE25-421)<br/>Practical (EE25-422)</b> |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>                                |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                        |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>                                   |
| <b>Marks</b>               | <b>: Theory (100)<br/>Practical (50)</b>            |
| <b>Instructor Name</b>     | <b>: Engr. Dr. Zain Anwar Memon</b>                 |

**DESCRIPTION:**

FPGA involves designing and developing digital systems using FPGAs. FPGAs are integrated circuits that can be programmed and reprogrammed to perform a wide range of digital functions. They are widely used in various industries, including telecommunications, aerospace, automotive, and consumer electronics. Students will learn the fundamentals of digital design, including Boolean algebra, combinational logic, and sequential logic.

**Mapping of SDGs**

|                                        |                                                                                                                    |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| SDG 8: Decent work and economic growth | 8.3: ..... decent job creation, entrepreneurship.....                                                              |
| SDG 9: Industry innovation             | 9.5: ..... encouraging innovation and substantially increasing the number of research and development workers..... |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                   | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|----------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Understand</b> the fundamentals of digital system design.                                                         | Cognitive     | C2                    | 3          | 35           |
|               | 2          | <b>Evaluate</b> complex FPGA systems with logic blocks, LUTs and memory.                                             | Cognitive     | C5                    | 3          | 40           |
|               | 3          | <b>Apply</b> the Hardware Description Language (HDL) to design hardware components and systems using software tools. | Cognitive     | C3                    | 2          | 25           |

## **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | <b>CLO</b> | <b>Description</b>                                                                                            | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|------------------|------------|---------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Practical</b> | 1          | <b>Implement</b> and verify digital-logic circuits on an FPGA using HDL-based design software under guidance. | Psychomotor   | P3                    | 8          | 50           |

## **COURSE OUTLINE (THEORY):**

Introduction to FPGA-Based Digital Design, Overview of digital design and FPGA technology, Applications of FPGA-Based Digital Design, Introduction to hardware description languages Combinational Logic Design, Boolean algebra and logic gates, Karnaugh maps and simplification, Implementation of combinational logic using FPGAs Sequential Logic Design, Flip-Flops and latches, State machines and state diagrams, Implementation of sequential logic using FPGAs, Hardware Description Languages, VHDL and Verilog, Design and simulation of digital systems using HDLs, Introduction to synthesis and optimization, FPGA Implementation and Verification, FPGA architecture and configuration, Synthesis and place-and-route, Verification and testing of digital systems using FPGAs Advanced Topics in FPGA-Based Digital Design, High-level synthesis and design automation, Reconfigurable computing and dynamic reconfiguration, Emerging trends in FPGA-Based Digital Design

## **COURSE OUTLINE (PRACTICAL):**

Introduction to Verilog HDL, gate-level modeling, data flow modeling, behavioral modeling, design, simulation, synthesis and fitting of combinational circuits, design and implementation of an FSM and memory.

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] S. Kilts, Advanced FPGA Design: Architecture, Implementation, and Optimization, latest ed. Wiley-IEEE Press.
- [2] S. Palnitkar, Verilog HDL, latest ed. Prentice Hall.
- [3] P. P. Chu, FPGA Prototyping by VHDL Examples: Xilinx Spartan-3, latest ed. Wiley-Interscience.
- [4] W. Wolf, FPGA-Based System Design, latest ed. Wiley.
- [5] S. Monk, Programming FPGAs: Getting Started with Verilog, latest ed. McGraw-Hill Education.
- [6] D. L. Perry, VHDL Programming by Example, latest ed. McGraw-Hill Education.
- [7] M. D. Ciletti, Advanced Digital Design with the Verilog HDL, latest ed. Prentice Hall.



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|                            |                                 |
|----------------------------|---------------------------------|
| <b>Subject Name</b>        | <b>: Industrial Electronics</b> |
| <b>Credit Hours</b>        | <b>: 3+1=4</b>                  |
| <b>Course Code</b>         | <b>: Theory (EE25-423)</b>      |
|                            | <b>: Practical (EE25-424)</b>   |
| <b>Effective</b>           | <b>: 2K25-BE(EE)</b>            |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                    |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48/16</b>               |
| <b>Marks</b>               | <b>: Theory (100)</b>           |
|                            | <b>: Practical (50)</b>         |
| <b>Instructor Name</b>     | <b>: Mr. Ghulam Mustafa</b>     |

**DESCRIPTION:**

Introduction to Industrial Electronics, Applications of industrial electronics and Overview of power electronics, motor control, sensors, and instrumentation. Industrial Electronics deals with the application of electronic principles and technologies to control and automate industrial processes. It involves the use of electronic devices, circuits, and systems to monitor, control, and optimize industrial processes, such as manufacturing, power generation, and transmission.

**Mapping of SDGs**

|                                        |                                                                                                           |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------|
| SDG 8: Decent work and economic growth | 8.8: ..... promote safe and secure working environments for all workers.....                              |
| SDG 9: Industry innovation             | 9.4: ..... greater adoption of clean and environmentally sound technologies and industrial processes..... |

**COURSE LEARNING OUTCOMES**

Upon successful completion of the course, the student will be able to:

|               | <b>CLO</b> | <b>Description</b>                                                                                                                  | <b>Domain</b> | <b>Taxonomy level</b> | <b>PLO</b> | <b>Marks</b> |
|---------------|------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|------------|--------------|
| <b>Theory</b> | 1          | <b>Design</b> using building block of industrial heating system                                                                     | Cognitive     | C6                    | 1          | 10           |
|               | 2          | <b>Analyze</b> the various control mechanism related to industrial drives                                                           | Cognitive     | C4                    | 2          | 30           |
|               | 3          | <b>Design</b> and Implementation of Industrial Electronic Systems and assess the impact of industrial electronic solution on energy | Cognitive     | C6                    | 6          | 30           |

|  |   |                                                                          |           |    |   |    |
|--|---|--------------------------------------------------------------------------|-----------|----|---|----|
|  |   | consumption and environmental sustainability.                            |           |    |   |    |
|  | 4 | <b>Evaluate</b> the integration of advance integrating system technology | Cognitive | C5 | 4 | 30 |

### **LABORATORY LEARNING OUTCOMES**

Upon successful completion of the lab experiments, the student will be able to:

|                  | CLO | Description                                                                                                    | Domain      | Taxonomy level | PLO | Marks |
|------------------|-----|----------------------------------------------------------------------------------------------------------------|-------------|----------------|-----|-------|
| <b>Practical</b> | 1   | <b>Demonstrate</b> Proficiency in Laboratory Techniques and Equipment                                          | Psychomotor | P4             | 1   | 10    |
|                  | 2   | <b>Perform</b> Experiments and Analyze Data                                                                    | Psychomotor | P5             | 2   | 20    |
|                  | 3   | <b>Integrate</b> and troubleshoot PLC-based industrial-control hardware to achieve specified system operation. | Psychomotor | P6             | 3   | 20    |

### **COURSE OUTLINE (THEORY):**

Introduction to Industrial Electronics, Applications of industrial electronics, Overview of power electronics, motor control, sensors, and instrumentation Power Electronics, Power semiconductor devices, Rectifiers and filters, DC-DC converters, Inverters, AC voltage controllers, Motor Control, DC motor control, AC motor control, Motor starting and braking Sensors and Instrumentation, Principles of sensing, Sensors for temperature, pressure, flow, and level, Signal conditioning circuits, Industrial Communication, Overview of industrial communication systems, Modulation techniques, Transmission lines and waveguides, Antennas and radiation, Industrial Automation, Programmable Logic Controllers (PLCs), Supervisory Control and Data Acquisition (SCADA) systems, Human Machine Interfaces (HMIs), Case Studies, Real-world examples of industrial electronics applications, Analysis and design of electronic circuits and systems in industrial settings.

### **COURSE OUTLINE (PRACTICAL):**

Experiments related to the principles of PLCs; speed control of DC, AC, and servo motors.

### **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] J. A. Rehg and G. J. Sartori, Industrial Electronics, latest ed. Pearson.
- [2] N. Mohan, T. M. Undeland, and W. P. Robbins, Power Electronics: Converters, Applications, and Design, latest ed. Wiley.
- [3] R. Pallas-Areny and J. G. Webster, Sensors and Signal Conditioning, latest ed. Wiley.

- [4] T. E. Kissell, Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls, latest ed. Prentice Hall.
- [5] B. Paul, Industrial Electronics and Control, latest ed. PHI Learning.
- [6] J. D. Irwin and C. H. Chen, Industrial Electronics Handbook, latest ed. CRC Press.





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|                            |                                                        |
|----------------------------|--------------------------------------------------------|
| <b>Subject Name</b>        | <b>: Introduction to Cooperative Housing Societies</b> |
| <b>Credit Hours</b>        | <b>: 3+0=3</b>                                         |
| <b>Course Code</b>         | <b>: Theory (HUM25-426)</b>                            |
| <b>Effective</b>           | <b>: 2K25-BE(E)</b>                                    |
| <b>Pre-Requisites</b>      | <b>: Nil</b>                                           |
| <b>Weeks/Lectures/Labs</b> | <b>: 16/48</b>                                         |
| <b>Marks</b>               | <b>: Theory (50)</b>                                   |
| <b>Instructor Name</b>     | <b>: Engr. Umair Abro</b>                              |

### DESCRIPTION

This course provides an understanding of the concept, structure, and functioning of cooperative housing societies, with emphasis on legal frameworks, management principles, community participation, and social responsibility. The course aims to develop awareness of collective housing solutions, governance mechanisms, and the role of cooperatives in sustainable urban development.

### **Mapping of SDGs**

|                                            |                                                                                                              |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| SDG 8: Decent work and economic growth     | 8.3: ..... decent job creation, entrepreneurship.....                                                        |
| SDG 11: Sustainable cities and communities | 11.a: ..... positive economic, social and environmental links between urban, peri-urban and rural areas..... |

### COURSE LEARNING OUTCOMES

Upon successful completion of the course, the student will be able to:

|               | CLO | Description                                                                                                                                                                                                       | Domain    | Taxonomy level | PLO | Marks |
|---------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|-----|-------|
| <b>Theory</b> | 1   | <b>Describe</b> the concept, principles, and importance of cooperative housing societies.                                                                                                                         | Cognitive | C2             | 6   | 15    |
|               | 2   | Explain the legal and administrative framework governing cooperative housing societies in Pakistan.<br><b>Explain</b> the legal and administrative framework governing cooperative housing societies in Pakistan. | Cognitive | C2             | 7   | 15    |
|               | 3   | <b>Apply</b> basic management and financial principles in the operation of cooperative housing societies.                                                                                                         | Cognitive | C3             | 11  | 20    |

## **COURSE OUTLINE THEORY**

Introduction to Cooperative Housing: Concept and philosophy of cooperation, History and evolution of cooperative movements. Principles of cooperative societies. Importance of cooperative housing in urban development. Cooperative Housing System in Pakistan. Cooperative housing societies in Pakistan. Role of government and regulatory authorities. Registration process and legal status. Comparison with private housing schemes. Legal and Administrative Framework. Cooperative Societies Acts and Rules. Bye-laws of cooperative housing societies, Rights and responsibilities of members, Role of managing committee and general body, Management and Finance of Cooperative Housing. Organizational structure. Financial management and budgeting. Maintenance, service charges, and audits. Transparency and accountability. Community Development and Social Responsibility. Community participation and engagement. Conflict resolution within housing societies, Gender inclusion and social equity, Ethical issues and civic responsibility, Sustainable and Modern Housing Practice. Sustainable housing concepts Environmental considerations in housing societies Smart and green housing initiatives. Future challenges of cooperative housing

## **RECOMMENDED TEXT AND REFERENCE BOOKS**

- [1] Cooperative Housing Societies: Law and Practice in Pakistan, latest ed.
- [2] Introduction to Cooperative Management, latest ed.
- [3] Housing Policy and Urban Development in Pakistan, latest ed.