

# Annexure I

## FIRST YEAR

### PE-101

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>  | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|--|-----------------------|---|
| 1            | Explain basic techniques, purposes and role of all important aspects of Petroleum Engineering        | C2                    | Engineering Knowledge                   |
| 2            | Carry out calculations related to reservoir properties and unit conversion for a given set of data   | C3                    | Engineering Knowledge                   |
| 3            | List, label and correctly identify the function of each equipment that are part of the rotary system | C1                    | Engineering Knowledge                   |

### PE-102

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>  | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|--|-----------------------|---|
| 1            | Define earth configuration, minerals, rocks, and Geological structures.                | C1                    | Engineering Knowledge                   |
| 2            | Discuss the processes of internal and external origin.                                 | C2                    | Engineering Knowledge                   |
| 3            | Investigate the minerals properties, rocks origin, geological features and structures. | C3                    | Investigation                           |

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**SECOND YEAR****PE-202**

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>   | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|---|-----------------------|---|
| 1            | Discuss origin, composition, properties, resources of petroleum fluids and Petroleum system elements and processes.                             | C2                    | Engineering Knowledge                   |
| 2            | Describe different rock properties, geological features, major oil and gas reservoirs of Pakistan and region.                                   | C2                    | Engineering Knowledge                   |
| 3            | Investigate the elements of Petroleum system, geological surface and sub-surface features and structures on geological cross sections and Maps. | C3                    | Investigation                           |

**PE-203**

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>   | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|---|-----------------------|---|
| 1            | Describe fundamental petro-physical properties  | C2                    | Engineering Knowledge                   |
| 2            | Solve problems related to petro-physical properties                                       | C3                    | Problem Analysis                        |
| 3            | Operate various petro-physical equipment to determine different petro-physical properties | P3                    | Modern Tool Usage                       |

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## PE-205

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Explain syntaxes, functionalities and keywords used in different computer programming languages.                       | C2             | Engineering Knowledge            |
| 2     | Apply computer programming concepts to develop computer programs, which can solve problems with in engineering domain. | C2             | Design/development of solution   |
| 3     | Translate problems into programs and solve them using different programming tools.                                     | C3             | Modern Tool Usage                |
| 4     | Display self-reliance when working independently.  | A2             | Individual and Team Work         |

## PE-206

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Explain the fundamentals of thermodynamics, thermodynamics laws, cycles and processes. | C2             | Engineering Knowledge            |
| 2     | Apply the laws of thermodynamic to chemical and phase equilibrium problems             | C3             | Problem Analysis                 |
| 3     | Operate various devices to measure thermodynamical properties.                         | P3             | Modern Tool Usage                |

## PE-207

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Define the functions of various components of drilling system.                            | C1             | Engineering Knowledge            |
| 2     | Apply the basic drilling engineering principles in general petroleum engineering problems | C3             | Problem Analysis                 |
| 3     | Operate under supervision to find different drilling parameters.                          | P3             | Investigation                    |

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## THIRD YEAR

### PE-302

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Describe fluid sampling, phase behavior, PVT experiments and properties of various reservoir fluids. | C2             | Engineering Knowledge            |
| 2     | Carryout the computation of PVT properties.  | C3             | Engineering Knowledge            |
| 3     | Use PVT data to provide solutions to reservoir engineering problems.                                 | C3             | Problem Analysis                 |
| 4     | Operate apparatus to measure the properties of reservoir fluids.                                     | P3             | Modern Tool Usage                |

### PE-304

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss the fundamentals of reservoir engineering, which includes basic laws, flow systems and equations through porous media. | C2             | Engineering Knowledge            |
| 2     | Derive and apply oil and gas material balance under various reservoir conditions for in-place and reserves estimation.         | C3             | Design/development of solution   |
| 3     | Investigate total recoveries and split in the form of various drive indices.   | C3             | Investigation                    |

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### PE-306

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss the basics of subsurface production with operations, equipment and related problems. | C2             | Engineering Knowledge            |
| 2     | Carry out the IPR and OPR problems related to well performance.                              | C3             | Problem Analysis                 |
| 3     | Discuss environmental issues due to production operations.                                   | C3             | Environment & Sustainability     |

### PE-308

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Describe fundamentals of economic principles in Petroleum industry  | C2             | Engineering Knowledge            |
| 2     | Apply methods of calculating the economic feasibility of proposed exploration, development and production project.                            | C3             | Problem Analysis                 |
| 3     | Describe methods used in Petroleum Industry regarding Petroleum Resource Management System for developing Reservoir Engineer Economics skills | C2             | Lifelong Learning                |

### PE-310

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Describe different techniques of gas processing to meet required specifications.  | C2             | Engineering Knowledge            |
| 2     | Discuss natural gas transportation and storage facilities keeping insight the legal, societal, technical as well as environmental issues. | C2             | The Engineer and Society         |
| 3     | Scrutinize Natural Gas by analyzing its' properties using available data through different methods.                                       | C3             | Investigation                    |

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### PE-311

| No. | CLO  | PLO                      | Taxonomy Level |
|-----|--|--------------------------|----------------|
| 1   | Discuss essentials of wire-line logging (Principle of measurements, tool, effects of logging environment, Quantitative and Qualitative uses of logs, Log Characteristics). | Engineering Knowledge    | C2             |
| 2   | Carry out Interpretation on well logs.   | Investigation            | C3             |
| 3   | Participate in teams during exercises.   | Individual and Team Work | A2             |

### PE-312

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Outline the principles, practices and equipment for designing a directional Relief Well                                     | C2             | Engineering Knowledge            |
| 2     | Outline the planning, budgeting and cost control of drilling operations   | C2             | Project Management               |
| 3     | Evaluate different systems of drilling operations such as casing, hydraulics, cementing etc.                                | C3             | Investigation                    |
| 4     | Operate under supervision in order to determine the Rheological properties and perform testing of different drilling fluids | P3             | Modern Tool Usage                |

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### PE-313

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>  | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|--|-----------------------|---|
| 1            | Describe relevant theories and methods of structural geology and geophysical exploration techniques.   | C2                    | Engineering Knowledge                   |
| 2            | Discuss the societal, health and legal issues related to geo-physical data acquisition.  | C2                    | The engineering society                 |
| 3            | Apply an appropriate set of geological and geophysical surveys to investigate a potential subsurface target.   | C3                    | Lifelong Learning                       |
| 4            | Investigate the 3D structures in 2D and interpret the 2D representation of a 3D structure, along with complete description of a hydrocarbon bearing strata using geo-scientific and engineering methods. | C3                    | Investigation                           |

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**FINAL YEAR****PE-401**

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>                                      | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|--|-----------------------|---|
| 1            | Describe the basic concepts of reservoir simulation.                       | C2                    | Engineering Knowledge                   |
| 2            | Solve reservoir fluid flow partial differential equations numerically      | C3                    | Problem Analysis                        |
| 3            | Develop reservoir simulation Data Files                                    | C5                    | Design / Development Of Solutions       |
| 4            | Prepare simulation outputs through relevant reservoir simulation software. | C3                    | Modern Tool Usage                       |
| 5            | Display self-reliance when working independently.                          | A2                    | Individual and Team Work                |

**PE-402**

| <b>Sr. #</b> | <b>Course Learning Outcomes (CLO)</b>  | <b>Taxonomy Level</b> | <b>Programme Learning Outcome (PLO)</b> |
|--------------|--|-----------------------|---|
| 1            | Describe the main concepts and techniques related to water aquifer classifications and modeling for different types of reservoirs.       | C2                    | Engineering Knowledge                   |
| 2            | Apply reservoir engineering techniques to solve the reservoir development and production problems occurred in different drive mechanism. | C3                    | Problem Analysis                        |
| 3            | Design a reservoir development plan case studies.  | C5                    | Design/development of solution          |
| 4            | Investigate key parameters related to reservoir development using numerical and analytical techniques.                                   | C3                    | Investigation                           |



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### PE-406

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss refinery products, processes, problems and function of refinery Units        | C2             | Engineering Knowledge            |
| 2     | Solve problems related to refinery engineering processes.                            | C3             | Problem Analysis                 |
| 3     | Operate different equipment's to measure properties related with petroleum products. | P3             | Modern Tool Usage                |

### PE-407

| Sr. # | Course Learning Outcomes (CLO)                                     | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss HSE related concepts and information to make society safe. | C2             | Engineer and Society             |
| 2     | Discuss Environmental issues and sustainability.                   | C2             | Environment and Sustainability   |
| 3     | Carryout HSE related projects                                      | C3             | Project Management               |
| 4     | Demonstrate good oral communication skills.                        | A3             | Communication                    |

### PE-408

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss the essentials related to pressure transient and well deliverability test. | C2             | Engineering Knowledge            |
| 2     | Develop mathematical models for the analysis of various well tests scenarios.      | C5             | Design/Development of Solutions  |
| 3     | Investigate well test data to infer well   | C3             | Investigation                    |

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|  | and reservoir parameter. |  |  |
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### PE-411

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Discuss different management skills required in project execution   | C2             | Engineering Knowledge            |
| 2     | Carryout different project tasks.   | C3             | Project Management               |
| 3     | Apply project management tools and skills to execute different task and activities for successful project completion. | C3             | Life-long learning               |
| 4     | Participate in teams during exercises.  | A2             | Individual and Team Work         |

### PE-412

| Sr. # | Course Learning Outcomes (CLO)  | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|---|----------------|----------------------------------|
| 1     | Define the fundamentals of different unconventional energy resources.   | C1             | Engineering Knowledge            |
| 2     | Discuss the techniques and associated challenges related to development/management of unconventional resources.         | C2             | Environment & Sustainability     |
| 3     | Apply the analytical and numerical techniques to solve the development/management issues of an unconventional resource. | C3             | Problem Analysis                 |

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## PE-413

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Discuss the methods, tools and designing parameters required for production systems.   | C2             | Engineering Knowledge            |
| 2     | Discuss environmental sensitive issue in production engineering practice   | C2             | Environment and Sustainability   |
| 3     | Diagnose production problems, to identify the source of the problem in the production system, and to select the correct method, stimulation or artificial lift to solve the problems | C4             | Investigation                    |

## PE-414

| Sr. # | Course Learning Outcomes (CLO)   | Taxonomy Level | Programme Learning Outcome (PLO) |
|-------|--|----------------|----------------------------------|
| 1     | Describe relevant theories, models along with appropriate applications of Water flooding and Enhanced Oil Recovery Method.             | C2             | Engineering Knowledge            |
| 2     | Design a flooding project.   | C5             | Design/Development of Solutions  |
| 3     | Investigate key parameters related to the development of water flooding and Enhanced Oil Recovery processes using relevant procedures. | C3             | Investigation                    |