## Artificial Intelligence in Oil Industry

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Artificial Intelligence in Oil Industry</th>
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<tbody>
<tr>
<td>Level</td>
<td>6</td>
</tr>
<tr>
<td>Reference No. (showing level)</td>
<td>EAX_6_299/PTRL26H02</td>
</tr>
<tr>
<td>Credit Value</td>
<td>10 credit points</td>
</tr>
<tr>
<td>Student Study Hours</td>
<td>Contact hours: 22 lectures + 11 Tutors</td>
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<td></td>
<td>Student managed learning hours: 100</td>
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<tr>
<td>Pre-requisite learning</td>
<td>-</td>
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<tr>
<td>Co-requisites</td>
<td>-</td>
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<tr>
<td>Excluded combinations</td>
<td>-</td>
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<tr>
<td>Module co-ordinator (Name + Email)</td>
<td>-</td>
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<tr>
<td>Faculty/Department</td>
<td>Petroleum &amp; Gas Technology department</td>
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<tr>
<td>Short Description</td>
<td>Reservoir mechanical properties, wellbore stability, sand production and microseisms</td>
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### Aims
The aim of this module is to develop students' skills for the fundamentals of Artificial intelligence and Data Mining and applications in oil industry and will provide the theoretical background for its most used components such as artificial neural networks, evolutionary computing, and fuzzy logic. The module will then provide some insight on the type of problems that can be solved using the artificial intelligence techniques and the types of problems that are not suited for AI. The last part of the module will be devoted to actual applications of these techniques in drilling, production and reservoir.

### Learning Outcomes

#### Knowledge and understanding
On completion of this module students should be able to demonstrate knowledge and understanding of:
1. Learn the basics of AI related oil industry;
2. State -of-the-art of AI applications in oil industry;

#### Subject-specific cognitive skills
On completion of this module students should be able to demonstrate ability in:
3. Define the different artificial intelligence techniques;
4. Prepare suitable AI to certain petroleum engineering problems;

#### Subject-specific practical skills
On completion of this module students should be able to demonstrate ability in:
5. Design an algorithm for certain problem solving
6. Predict reservoir, drilling and production parameters using AI;

#### Key/transferable skills
On completion of this module students should be able to demonstrate ability in:
7. Apply their understanding of AI to propose a solution for an oil industry problem;
8. Develop a suitable algorithm for solving real industry problems.
## Employability

To prepare student to get job and be professional graduate in future, the development of one or more of top engineering skills, namely problem solving, communication, management and environment and economics, is addressed in this module.

Personal development planning is also one of our focuses in this module.

## Teaching and learning pattern

1. 22, 1h lectures. This method informs learning outcomes 1, 2, 3, 7.
2. 11, 1h problem-solving techniques and exercise classes. This method informs learning outcomes 3, 5, 6, 7, 8.

## Indicative content

- Artificial Intelligence & Data Mining; an over view
- Artificial Neural Networks
- Evolutionary Computing
- Fuzzy Logic
- Hybrid Intelligent Systems
- Field Applications & Hands on exercises
  1. Optimization of Hydraulic Fracturing
  2. Stimulation/Workover Candidate Selection
  3. Intelligent Production Data Analysis for:
  4. Optimization of infill locations
  5. Optimization of underperformer wells
  6. Virtual Multi-Phase Flow Metering
  7. Casing design programme
  8. Petrophysical properties prediction

## Assessment

**Elements & weightings**

- **Examination**: A 180 minutes unseen written examination assesses learning outcomes 1, 2, 3, 7, 8. 70%
- **Course Work**: 30% A group of (4 to 6 students) in-class assessments and technical group reports. This method carries 30% of the total mark and assesses learning outcomes 3, 5, 6, 7. 30%
- Students must achieve (i) 40% for the total module mark and (ii) at least 30% in the unseen examination and the course work in order to achieve an overall passing mark for this module.

## Indicative Sources

*(Reading lists)*

1. A group of (4 to 6 students) in-class assessments and technical group reports will be assigned throughout the semester. This method carries 30% of the total mark and assesses learning outcomes 3, 5, 6, 7,
2. A 180 minutes final exam carries 70% of the total mark and assesses learning outcomes 1, 2, 3, 7.