19PEM111, Well Stimulation: Conventional & Unconventional Reservoirs

Teaching Scheme					Exam Scheme					Total Marks
L	T	P	C	Hrs/Week	Theory			Practical		
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

Unit-1 — **4 Hours**

Conventional vs Unconventional reservoirs

Geology and geochemistry, Source vs trap reservoirs, Physical properties, Mechanical properties, Well testing, Petrophysics analysis, Reservoir simulation, Production decline analysis

Geomechanics of the unconventional reservoirs

Failure mechanisms and criteria (compressive, tensile, shear, creeping, pore collapse, plastic behavior, Brittleness factors); Effective stress concept of the conductive elements; matrix, natural fractures, beddings, and induced fracture.; Stress profile and fracture height containment ; Stress shadowing effect; Understanding the critically stressed natural fractures and beddings

Unit-2 — **4 Hours**

Hydraulic fracturing: Design and modeling

Dynamic and static mechanical properties; Stress field; measurement and estimation; Fracturing fluid rheology; Fluid leakoff; fluid loss modeling, fluid shear history; Proppant selection; Pressure diagnostic techniques; Modeling a hydraulic fracture: Plain strain, elastic deformation, width development and fracture propagation; CGD, KGD, Fracpro, Gohfer, and new models for network fracturing

Unit-3 — **8 Hours**

International field examples demonstrating current technologies to develop unconventional reservoirs

Major shale oil and shale gas basins; Well-pad configuration and horizontal wells; Horizontal wells placement and spacing; Sweetspot identification; Well completion: Multistage fracturing; plug & perf, ball-activated sliding sleeves, coiled tubing activated. ; Fracturing stages, stages spacing and clusters spacing; Fracturing fluids; nano surfactants, slick water fracturing, high viscosity friction reducers; Proppant selection: local sand, light weight proppant, hybrid in size or density ; Complex fracture modeling; Diagnostic methods: DFIT, microseismic, fiber sensing, and tiltmeter; Water management; Production optimization

Unit-4 — **4 Hours**

Local examples: Case studies discussion & term papers

The SPE papers provided below will be covered as lectures and students' presentations.

Emerging technologies

1. Refracturing: when it is successful, candidate selection, procedures, economics and case histories.
2. IOR/EOR techniques
3. Waterless fracturing; energetic fracturing, Pulse fracturing, Cryogenic fracturing, Exothermic chemical pulse fracturing, and laser perforation/fracturing

Total Hours: 20

Text Books and Reference