Ref: IIPE/ 1st AS Meeting/2021/001 Date: 03.03.2021

Minutes of the 1st meeting of the Academic Senate, IIPE held on 03rd March, 2021 at 10.30 AM offline and through Cisco WebEx (virtual meeting).

MEMBERS PRESENT: -

Prof. V.S.R.K Prasad, Director (in Chair);
Prof. S Neogi, IIT Kharagpur, SPOC, (Mentor Institute);
Shri. Deepak V Shastry, Executive Director, (Training R&D and Start Up), GAIL;
Shri. Rama Sakthivel, Site Manager, Shell Technology Centre Bangalore;
Shri. Ratan Raju, Executive Director, HPCL, Visakh Refinery;
Shri. Saloma Yomdo, CGM (RES) & Head, COEES;
Dr. Pratibha Biswal, Assistant Professor, Associate Dean (Students' Affairs) ;
Dr. P Aparoy, Asst. Professor, Associate Dean (R&D);
Dr. G Nagesh, Asst. Professor, Associate Dean (Planning Resources & Alumni);
Dr. Deepak Amban Mishra, Asst. Professor, Associate Dean (Academic Affairs & Admin);
Dr. Somnath Ghosh, Asst. Professor, Associate Dean (Faculty Affairs);
Dr. Rajat Jain, Asst. Professor, DIC (PE);
Dr. P Venkata Reddy, Asst. Professor, DIC (CHE);
Dr. Arun Kumar Pujari, Asst. Professor, DIC (Mech. Engg & other Engg. Programs);
Dr. Ramunaidu, Assistant Professor, DIC Examination Cell;
Dr. T Hemanth Kumar, Asst. Professor;
Dr. Himangshu Kakati, Asst. Professor;
Dr. Ranjan Pramanik, Assistant Professor, Petroleum Engg;
Dr. C. Veerabhadra Rao, Assistant Professor, CSE;
Dr. B Murali Krishna, Registrar I/c, Member Secretary;

Agenda: -

(i) Course work for PhD (course work and course number);

(ii) Starting 2-year MSc in Applied Geology and M. Tech. in Energy Engineering;

(iii) Change of syllabus in Mathematics for IIPE Students;

(iv) Pending lab course work;

(v) Summer internship for 3rd and 4th year students;

(vi) Innovative Research Grant under the Institute Research Grant;

(vii) Any other item with the permission of the Chair.

The Meeting was chaired by the Director, IIPE. The list of participants who attended the meeting is enclosed to this Minutes. The Director, IIPE informed that the quorum for the meeting is present.

The Academic Senate on record placed its appreciations to all the members of the Advisory Committee (which performed the duties of Academic Senate until Academic Senate is formed), for their contribution in shaping the curricula and sparing their valuable time since its inception.

The Director Congratulated for being nominated as member of first Academic Senate of IIPE and welcomed them. The Director gave a brief introduction of IIPE and its journey its inception and about the faculty members to the Academic Senate. The agenda point discussions and decisions taken thereof are given in the succeeding paragraphs.

Agenda Point 1: - Course work for PhD (course work and course number)

LIST OF COURSES FOR PHD COURSE WORK

Common Courses for PhD program				
S.No.	**Title**		**Credits**	**Mode of the course**
1	English for Technical Writing	Compulsory	3	
2	Research Methodology	Interdisciplinary	3	
3	Statistical techniques and computer programming		3	
4	Project Engineering and Management		3	
5	Society Science and Technology		3	

Courses in Biology and related areas				
S.No.	**Title**	**Core/Elective**	**Credits**	**Mode of the course**
1	Cell Biology	Core	3	Swayam/online (08 weeks)
2	Biomass Conversion and Biorefinery/ Bioenergy	Core	3	Swayam/online (12 weeks)
3	Experimental Biotechnology/ Bioanalytical techniques	Core	3	Swayam/online (12 weeks)
4	Biochemistry	Core	4	IIPE (16 weeks)
5	Research oriented topic	Elective	3	IIPE
6	Computer Aided Drug Design	Core	2	Swayam/ IIPE
7	Biostatistics and Design of experiments	Elective	2	Swayam/ online (08 weeks)
8	Computational Systems Biology	Elective	2	Swayam/ online (08 weeks)
9	Industrial Biotechnology	Elective	2	Swayam (08 weeks)
10	Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems	Elective	2	Swayam (08 weeks)
11	Bioinformatics: Algorithms and Applications	Elective	4	Swayam
12	Structural Biology	Elective	4	Swayam (12 weeks)
13	Programming, Data Structures And Algorithms Using Python	Elective	2	Swayam (08 weeks)
14	Biomolecules: Structure Function in	Elective	3	Swayam/Online

	Health and Disease			
15	Biomass Characterization	Core	3	Swayam/Online

Courses in Chemistry and related areas				
S.No.	**Title**	**Core/Elective**	**Credits**	**Mode of the course**
1	Instrumental Methods (Physical Measurements)	Core	3	IIPE/AU/Other institute
2	Characterization of Materials	Core	4	IIPE/online/Swayam
3	Chemistry Pedagogy	Core	3	IIPE
4	Nanomaterials synthesis, properties and applications	Elective	3	IIPE/ Dr. Somnath/Kumud
5	Polymer Chemistry	Elective	3	IIPE/Dr. Ch Gupta Chandaluri
6	Nanocarbon Chemistry	Elective	3	Dr. Kumud
7	Fundamentals of Energy Storage	Elective	3	Dr. Kumud
8	Surface Chemistry	Elective	3	Dr. Somnath
9	interdisciplinary course from CE/PE/ Basic sciences/ME	Elective	3	IIPE/onlline
10	Basic Organic/Physical/Inorganic	Elective	3	online/Swayam
11	Advanced Organic/Physical/Inorganic	Elective	3	online/Swayam
12	Fundamentals of Spectroscopy	Elective	3	online/Swayam

Courses in Mathematics and related areas				
S.No	**Title**	**Core/Elective**	**Credits**	**Mode of the course**
1	Algebra	Core	4	IIPE/Online
2	Advanced topics in Analysis	Core	4	IIPE/Online
3	Probability & Statistics	Core	4	Dr. R. Ramunaidu
4	Approximation Theory	Elective	3	IIPE/Online
5	Sparse and redundant representation theory	Elective	4	Dr. R. Ramunaidu
6	Signal Processing	Elective	3	IIPE/Online
7	Programing language	Core	4	IIPE/Online
8	Topics in Numerical Analysis	Core	4	IIPE/Online
9	Partial Differential Equations-I	Core	4	IIPE/Online
10	Partial Differential Equations-II	Elective	4	IIPE/Online
11	High Resolution Schemes for Nonlinear PDE-I	Elective	4	Dr. Rathan
12	High Resolution Schemes for Nonlinear PDE-II	Elective	4	Dr. Rathan
13	Finite Difference Methods for Differential Equations	Core	4	IIPE/Online

Courses in Petroleum Engineering & Earth Sciences						
Sl No.	Subject code	Name of the Subjects	Teaching Plan Hours/Week			Credit
			L	T	P	
1	ES6001	Petroleum Geology and Sed. Basins of India	3	1	0	4
2	PE6001	Well planning and well control	3	1	0	4
3	PE6002	Advanced Reservoir Engineering	3	1	0	4
4	PE6003	Advanced Well Completion and Workover	3	1	0	4
5	ES6002	Geomechanics of rock fracturing	3	1	0	4
6		Elective I	0	0	3	3
7	PE6004	Petroleum Engineering Laboratory	0	0	3	2
Elective-I Oil and Gas Processing Plant Design; Drilling Fluid Engineering; Polymer Technology						
1	PE6005	Unconventional Energy Resources	3	1	0	4
2	PE6006	Deep-Sea Engineering	3	1	0	4
3	PE6007	HSE in Petroleum Industry	2	0	0	2
4	ES6003	Well log Analysis	3	1	3	4
5		Elective II	3	0	0	3
Elective-II • Application of Nanotechnology & Surfactant science in EOR • Reservoir modeling and simulation • Natural Gas Engineering						

Sl. No	Courses	Mode of the course
1.	Computational Fluid Dynamics	IIT Madras
2.	Process Optimization	IIT Madras
3.	Numerical Methods and Scientific Computing	IIT Madras
4.	Data Analysis and Visualization in R/Python/SQL	IIT Madras
5.	Enhanced Oil Recovery	IIT Madras/IIPE
6.	Flow and Transport in Porous Media	IIT Madras/IIPE

Courses in Mechanical Engineering related area specialization				
S.No	Title	Core/Elective	Credits	Course offered
1	Advanced Heat transfer	Core	4	
2	Advanced fluid mechanics	Core	4	
3	Introduction to CFD	Core	3	
4	Measurement techniques	Elective	3	

Courses in computer science engineering related area specialization

S.No	Title	Core/Elective	Credits	Course offered

1	Probability and Linear Algebra	Core	3	Available on Swayam
2	Advanced Data Structures and Algorithms	Core	3	Available on Swayam
3	Artificial Intelligence	Elective	3	Available on Swayam
4	Machine Learning	Elective	3	Available on Swayam
5	Distributed Systems	Elective	2	Available on Swayam
6	Cloud Computing or Hadoop	Elective	2	Available on Swayam

Courses in Electrical Engineering related area specialization

S.No	Title	Core/Elective	Credits	Course offered
1	CONTROL ENGINEERING	Core	4	Available online
2	Fundamentals of Power Electronics	Core	4	Available online
3	Power Quality Improvement Technique	Core	3	Available online
4	High Power Multilevel Converters - Analysis, design and operational issues	Elective	4	Available online
5	Introduction to Smart Grid	Elective	3	Available online

Courses in Chemical Engineering

Sl. No	Elective	Mode of the course
1	Modern Control Theory	IIT Madras
2	System Identification Process Optimization Graph Theory and its applications in process design	
3	Multivariate Data Analysis for Process Modeling	
4	Mathematical methods for chemical engineers Chemical reaction engineering	
5	Transport phenomena	
6	Modern Control Theory System Identification	
7	Process Optimization	
8	Multivariate Data Analysis for Process Modeling Mathematical methods for chemical engineers Transport Phenomena	
9	Process modelling and simulation Technology of Surface Coating	IIT Madras IIT KGP
10	Plasma Physics: Fundamentals and Applications	
11	Novel Separation Processes Advanced Mathematical Techniques in Chemical Engineering Process Modelling and simulation	IIT KGP IIT KGP /IIPE
12	Novel Separation Processes	IIPE
13	Advanced Mathematical Techniques in Chemical Engineering	IIT KGP

14	Wastewater Management Process Modelling and simulation	IIT KGP/ IIPE
15	Renewable Energy Technology (Elective) Computational Fluid Dynamics (Elective)	IIT Madras
16	Thermal Energy Conservation (Elective)	
17	Topics in Thermal Engineering (Elective) Solar energy for process heat and power generation (Elective)	
18	Advanced Chemical Engineering Thermodynamics (Core) Advanced Transport Phenomena (Core) Advanced CFD (Core)	

Approval sought: -

IIPE seeks approval for the implementation of the PhD course work.

Resolution: -

It was resolved that the candidates enrolled for the Ph.D. program are required to complete the course work as prescribed below:

I) Compulsory courses:

1. English for Technical Writing: (3 credit);

II) Courses as decided by the Doctoral Scrutiny Committee (DSC):

❖ **One from the following Interdisciplinary subjects**

1	Innovative Behaviour an Management	3 credits
2	Research Methodology	3 credits
3	Statistical techniques and computer programming	3 credits
4	Project Engineering and Management	3 credits
5	Society Science and Technology	3 credits

However, in later year shifting Research Methodology to Compulsory Course with 1 credit be considered.

❖ A set of subjects to be recommended by the DSC considering the student's skill requirements for the research work to be under taken by the student and his (or her) academic background to have a credit loading as under.

- For students admitted on the basis of M.Tech. or equivalent degree:
  Lower limit: 10, Upper Limit: 20 (Including the interdisciplinary subject)
- For students admitted on the basis of M.Tech. or equivalent degree, who had done their qualifying degree 8 years before the admission:
  Lower limit: 20, Upper Limit: 40 (Including the interdisciplinary subject)
- For students admitted on the basis of B.Tech., M.Sc. or equivalent degree:
  Lower Limit: 20, Upper Limit: 40 (Including the interdisciplinary subject)
- For students admitted on the basis on B.Tech., M.Sc. or equivalent degree, who had done their qualifying degree 8 years before the admission:
  Lower Limit: 40 (Including the interdisciplinary subject)

Candidates assigned course work must obtain, in the 7-scale grading system, a grade not lower than 'C' in each of the subjects. If the grade obtained by a candidate in any subject is below 'C', the candidate is required to repeat that subject and clear it with a grade not lower than 'C'. If the candidate fail to clear the course work within 1 year of enrolment, the DSC may review the performance of the student and recommend a change of course work.

Agenda Point 2: - Starting 2-year MSc in Applied Geology and M Tech in Energy Engineering

Implementation of M.Sc. Program at IIPE

Name of the Program	**:**	**2-Year M.Sc. in Applied Geology**
Department/Division	**:**	**Earth Sciences**
Program Size	**:**	**15 Students per Batch**
Proposed Start Date	**:**	**Autumn Semester, 2020-2021**
Program Type	**:**	**Undergraduate**
Delivery Mode	**:**	**On-ground**

Indian Institute of Petroleum & Energy Visakhapatnam

Appropriateness to Mission

The oil and gas industry in India require skilled geologists and geophysicists (about 1250 by 2020-2024) with significant expertise in exploration if the targets set forth in the 'Hydrocarbon Vision 2025' are to be achieved. Existing academic institutions in India are not sufficient to ensure industry stability in terms of manpower supply. IIPE with its unique vision and mission can now implement 'M.Sc. in Geology' program as defined in its Detailed Project Report (DPR) in order to develop qualified human capitals to meet the gap.

1. Program goals

The goal of the 2-year M.Sc. in Geology program is to produce highly skilled geologists with specialized knowledge on Fossil fuel and Ground water exploration, mineral exploration, subsurface modelling, estimation of resources and site investigation.

2. Student Admission Requirement

Students should have qualified Joint Admission Test for M.Sc. (JAM) which is an all-India examination conducted across the country jointly by IITs and IISC.

Eligibility Criteria: Bachelor's degree with minimum 60% in Geology and JAM Score.

3. Course Curriculum

M.Sc. Applied Geology will be imparted to students for two academic sessions consisting of four semesters as given below:

SEMESTER - I						
Sl. No	**Faculty**	**Course name**	**L**	**T**	**P**	**Credit**
1	F4	Igneous and Metamorphic Petrology	3	1	0	4
2	F5	Sedimentology Geology and Stratigraphy	3	0	0	3
3	F1	Geonumerics	1	0	3	3
4	F6	Remote Sensing & GIS	3	0	0	3
5	F2	Geology of Fuels	3	0	0	3
6	CHY1	Geochemistry and Geochemical Prospecting	3	0	0	3
7	F7	Advanced Geomorphology	3	0	0	3
8	F4	Petrological Laboratory	0	0	3	2
9		Geological Fieldwork I	0	0	0	2
Total			**19**	**1**	**6**	**26**

SEMESTER - II						
Sl. No	**Faculty**	**Course name**	**L**	**T**	**P**	**Credit**
1	F6	Economic and Mining Geology	3	1	0	4
2	PE 1	Introduction to Petroleum Engineering	3	0	0	3
3	F5	Basin Formation, Development and Analysis	3	0	0	3
4	F4	Advanced Structural Geology	3	0	0	3
5	F3	Fundamentals of Geophysics	3	0	0	3
6	F2	Engineering Geology and Hydrogeology	3	1	0	4
7	CHY1	Geochemistry Lab	0	0	3	2
8	F4	Structural Geology Lab	0	0	3	2
Total			**18**	**2**	**6**	**24**

SEMESTER - III						
Sl. No	**Faculty**	**Course name**	**L**	**T**	**P**	**Credit**
1	F3	Geophysical Prospecting	3	1	0	4
2	F7	Geohazards and Environmental Geology	3	0	0	3
3	F6	Geostatistical Earth Modelling	3	0	0	3
4	PE2	Drilling Engineering	3	0	0	3
5	PE3/F5	Elective - I	3	0	0	3
6	F2	Engineering Geology and Hydrogeology Lab	3	0	0	2
7	F3	Prospecting Lab	0	0	3	2
8		Industrial training	0	0	0	2
9		Project	0	0	3	2
10		Geological Fieldwork II	0	0	0	2
Total			**15**	**1**	**9**	**26**

SEMESTER – IV						
Sl. No	**Faculty**	**Course name**	**L**	**T**	**P**	**Credit**
1	F3	Elective - II	3	0	0	3
2	F1	Geomechanics	3	1	0	4
3	F2	Well Logging	3	0	0	3
4	F2	Well Logging Lab	0	0	3	2
5	F6	Geostatistical Earth Modelling Lab	0	0	3	2
6		Comprehensive Viva	0	0	0	2
7		Project	0	0	12	6
Total			**9**	**1**	**15**	**22**
CUMULATIVE TOTAL			**61**	**5**	**36**	**98**

Detailed Syllabus for Semester - I

Igneous and Metamorphic Petrology

Introduction: Overview of petrology, rocks. Structure and dynamics of the Earth. Where are igneous rocks generated; Classification and nomenclature; Textures, Structures and field relations; Phase rule, unary, binary and Ternary Systems; Mantle melting & generation of basalts; Diversification of magmas; Igneous Rock Associations (subduction zones and granitoids); Magmatism and plate tectonics.

Introduction to metamorphism, types of metamorphism; Limits and controls of metamorphism; Metamorphic textures and structures; Metamorphic zones and facies; Chemographics and metamorphic phase diagrams; Pelitic Rocks: Barrow's zones, AFM projections, discontinuous and continuous reactions; Types of metamorphic reactions; Metamorphism of mafic rocks, ultramafic rocks and calcareous rocks; P-T paths and orogeny; Thermobarometry; Metamorphic Fluids, mass transport and metasomatism; Garnitisation and Migmatites;

Sedimentology and Stratigraphy

Origin transport and deposition of sediments; Sedimentary textures and structures; Composition, Classification and Diagenesis of siliciclastic and carbonate rocks. Other Chemical/Biochemical and Carbonaceous Sedimentary Rocks; Depositional Environments and their significance; Paleocurrent analysis; Sedimentary basins of India.
Principles of Stratigraphy and code of stratigraphic nomenclature in India; Lithostratigraphy; Seismic, Sequence and Magnetic Stratigraphy; Biostratigraphy; Chronostratigraphy and Geologic Time; Principle of stratigraphic correlation; Indian Strtigrahy: cratons, fold belts, supracrustals and intercratoninc basins.

Geonumerics

Development of algorithms and flowcharts. Basic elements of Matlab/Python: variables, data types, declarations. Expressions: literals, characters and strings. Arithmetic operations, order of operations, intrinsic functions. Input/output. Conditional statements. Logical operations. File operations: open, read, write, close. Programming exercises in simple numerical analysis and in geoscience application areas: Finding roots, Interpolation, non-linear system of equations, Measures of Central Tendency, Dispersion, Bivariate Statistics, Regression, semi-variograms, directional variograms, and covariance, neural network.

Remote Sensing and GIS

Electromagnetic radiation and remote sensing: interaction of EMR with atmosphere and terrain features, platforms and sensors, resolution and calibration aspects of remotely sensed data, photogrammetry, aerial photo interpretation, satellite remote sensing, fundamentals of digital image processing and classification.
Introduction to Geographic Information System, spatial data models and data structures, visualization and query of spatial data, overlay analyses.

Geological applications of remote sensing data and GIS; Recent trends in RS & GIS.

Geology of Fuels

Nuclear fuel cycle, mineralogy and geochemistry of radioactive minerals. classification of uranium deposits, metallogenic epochs and provinces of uranium mineralisation. uranium exploration. nuclear waste disposal. Instrumental techniques of detecton and measurement of radioactivity.
Origin of petroleum, source rock characteristics; Maturation of kerogen, palaeothermometers; composition of petroleum; Primary and secondary migration; Reservoirs – porosity, permeability and capillary pressure, reservoir heterogeneity, drive mechanisms; traps and seals – classification of traps; Subsurface environments: water, temperature and pressure; Brief idea about the hydrocarbon resources of India.
Origin of coal; classification of coal; morphology, composition of peat, lignite, anthracite; Structure and petrography of coals; Physical and chemical properties of coal; Coal reserve in India; Exploration of coal; utilization of coal- combustion and gasification of coal; coal and environment.

Geochemistry and Geochemical Prospecting

Principles of crystal chemistry; Chemical bonds, Coordination principle, Radius ratio, Crystal structure; Cosmic abundance of elements, Geochemical classification and distribution of

elements in the earth; Geochemical cycle (Sulphur cycle, Nitrogen cycle, Phosphorous cycle) Primary geochemical differentiation of the earth; Composition of the Earth's core, mantle and crust; Composition of hydrosphere and atmosphere. Role of Eh-pH in ore formation; Phase rule and its application. Introduction of isotope geochemistry. Trace elements: classification and significance in petrogenesis; REE: properties, uses and favorable host rock.
Principles and methods of geochemical prospecting, pathfinders and trace elements in rocks and soils. Primary and secondary dispersion patterns, geochemical anomalies and their interpretation

Advanced Geomorphology

Nature & Scope of Geomorphology • Fundamental concepts in geomorphology • Concepts of Uniformitarianism and Threshold in Geomorphology • Multicyclic landforms • Concepts of gradation: Types and classification of weathering, mass wasting, Cycle of erosion Davis and Penck • Erosional and depositional landforms produced by running water, glacier, wind, Waves, Underground water. • Natural Hazards due to geomorphic activities. Rock slides, Rock fall, fluvial hazard, • Role of Geomorphology in Hazard management. • Morphometric Analysis: Its geographical significance, Fluvial Morphometry: Linear Aspects, Areal Aspects, Relief Morphometry: Hypsometric analysis, Altimetric analysis, Slope Analysis, Profile Analysis

Petrological Lab

Megascopic and microscopic identification of igneous, sedimentary and metamorphic rocks, CIPW normative calculation, Use of ACF, AKF and AFM diagrams for the study of metamorphic rocks. Mechanical analysis of supplied sediment sample. Graphical plotting of given size data and determination of sample statistics. Determination of paleocurrent direction with the help of rose diagram drawn from supplied data.

Economic and Mining Geology

Introduction/Earth Resources/Minerals Industry; Types & Origin of Mineral Resources; Modern Resource-forming Systems; Magmatic Hydrothermal Ore Deposits; Ores in Continental and Marine Volcanics; Weathering, supergene enrichment and residual deposits. Sedimentary, metamorphic and metamorphosed ore deposits. Stratiform and stratabound ore; Distribution and geological characteristics of major mineral deposits of India; National Mineral policy; Mineral concession rule; Marine mineral resources and law of the sea.

Geological mapping, guides for ore search, delineation of ores, Surface exploration (pitting-trenching, channel sampling), core-sampling, reserve estimation. Introduction to underground and surface mining methods. Underground exploration and sampling of ore deposits. Methods of computation of developed ore reserves. Introduction to geostatistical ore reserve estimation.

Introduction to Petroleum Engineering

Composition of oil, gas, and water; Elementary concepts of Reservoir modelling techniques, Drilling & Well completion, Pumping; System & Artificial Lift, Water flooding, Enhanced Oil Recovery, Transportation of crude oil and natural gas, Application of the products, derived from petroleum, Unconventional Reserve, Offshore and subsea completions; Challenges and broader economic and environmental impacts; Major international hydrocarbon reserves; Petroleum Economics and drivers in global scale; Sustainable development through objective review of options in the Energy Basket.

Engineering Geology and Hydrogeology

Engineering properties of rocks, and soils and their classifications. Weathering. Discontinuities in rock masses. Engineering behaviour of rock materials and rock masses. Rock mass classification system; Rock slope stability, landslides and stability of structures, construction materials; Geological investigation of dams and reservoirs, tunnels and excavations, bridges. Shoreline engineering; Foundations and structures in earthquake prone regions. Site investigations and important case studies. Problems of ground water in engineering projects. Surveying.

Hydrologic cycle, runoff estimation, vertical distribution of soil moisture, groundwater, aquifer systems, springs, groundwater flow, coastal aquifers and seawater intrusion, well hydraulics, field techniques in groundwater exploration and exploitation, chemistry and quality, case studies on groundwater development and management.

Advanced Structural Geology

Basic continuum mechanics (stress, strain, and rheology); Quantitative approach of stress and strain in various tectonic setting; Description and analysis of fractures (i.e., landslides, faults, and intrusive bodies); Rock deformation and rheology in the light of brittle, ductile and plastic deformation processes; Structural mapping techniques and tools.

Basin Formation, Development and Analysis

Classification and mechanics of formation of major basin types, subsidence analysis, fill character and modelling techniques. Application to petroleum play assessment; Facies analysis: Principles, siliciclastic and carbonate facies models. Basin mapping methods-structure and isopach contouring, lithofacies and biofacies maps, preparation of stratigraphic crosssections and palaeogeographic synthesis; regional and global stratigraphic cycles. Heat flow analysis for understanding maturity of the basin. Resource potential of sedimentary basins. Basin modeling and its uses, Basin modeling techniques.

Fundamentals of Geophysics

Introduction to geophysics, Earth as a planet and member of the solar system, origin and evolution of the Earth, Internal structure of the Earth; Concept of plate tectonics, plate motions and triple junctions; Gravitation, gravity anomalies and its variations, geoid, isostasy, rheology; Geomagnetic field, its origin and variations, paleomagnetism, and geomagnetic reversals; Introduction to seismology, seismic waves - P, S and surface waves, seismograph, travel time curves and radial Earth structures, general properties of surface waves and normal modes, earthquake source theory, intensity and magnitude scales of earthquakes, PREM model, elastic rebound theory, global seismicity and tectonics, focal mechanisms, seismic anisotropy; Heat within the Earth, thermal structure of continental and oceanic lithospheres at subduction zones and spreading centers, mantle convection.

Geochemistry Lab

Chemical analysis of rocks and minerals, digestion techniques, preparation of standards, estimation of major oxide percentages using spectrophotometric / flame photometric and titrimetric methods. Preparation of calibration curves. Gravimetric estimation of silica and R_2O_3.

Structural Geology Lab

Topographic map study, Measurement of attitude of planar and linear structures, Profile and cross section. from given geological map. Interpretation of geological maps. Outcrop completion, 3-point problem, Geometric and trigonometric methods of calculation of orientation and thickness of beds, Equal area projection of planar and linear structural data. Two dimensional strain analysis from the supplied specimen and data. Computer aids to analysis of structural data.

Geophysical Prospecting

Gravity method: Gravitational force; Gravitational acceleration; Gravitational potential, Earth's gravitational field, Collections; corrections and presentation of Gravity data, Regional and residual anomalies, Gravity anomaly over buried objects of known shape: sphere, cylinder, Gravity corrections: Free-air correction, Bouguer correction, Latitude correction, Terrain correction. Interpretation of gravity anomalies with case studies.

Magnetic method: Geomagnetic field, Induced magnetism, Remanent magnetism, Susceptibility, Field survey method, Equipment, Data processing, Qualitative and quantitative interpretation of magnetic data.

Electrical Methods: Electrical properties of rocks, Flow of current through ground surface, Apparent resistivity, Electrode arrangements, VES and CST and their qualitative interpretation, Quantitative interpretation of VES curves with case studies.

Electromagnetic methods: Electromagnetic spectrum and induction, EM frequency and depth of penetration, EM response of conductors, Classification of EM methods and their description: Telluric current method, Magnetotelluric method, CSMT/CSAMT, Tilt angle method, Turam method, VLF method, Transient EM methods, Ground Penetrating Radar,

Induced Polarization Methods: Earth's polarization, IP measures, Time and frequency domain techniques, Field surveys, Equipments, Data acquisition and interpretation.

Seismic Methods: Basic principles, Types of seismic waves and their propagation characteristic, Seismic velocities in Earth's materials, Refraction and reflection seismic methods: Basic principal, field procedure, data acquisition and interpretation, Siesmic startigraphy, Detection of hydrocarbons.

Radiometric Methods: Basic principles, Radioactive elements in rocks, Gamma ray spectrum and spectrometer, Radon sniffer, Data collection and interpretation.

Thermal methods: Thermal conductivity of rocks and minerals, Temperature measurements, Field surveys, Interpretation.

Airborne, marine and satellite geophysics: Airborne survey, Data acquisition, Equipment, Measurement, Data processing and interpretation, Marine geophysics, Satellite-gravity-magnetic and thermal imagery.

Geohazards and Environmental Geology

Interaction between modern society and Earth processes and resources; Natural Earth processes - earthquakes, volcanic eruptions, flooding, meteorite impacts, mass wasting, coastal processes, and climate trends.

Introduction to Himalayan geology; Landslides and slope failures: causes and effects, stability measures, case studies; Landslide zonation of India; Avalanche monitoring, GLOF studies; River morphology and basin studies.

Development of natural resources, pollution and waste disposal, climate change, land use and engineering, and energy resources. Geological causes of soil, air and water pollution. Waste disposal.

Geostatistical Earth Modelling

Elementary Statistics, Analysis of Sequences of Data, Geostatistical modeling, quantification of connectivity, lithofacies, porosity, permeability using variogram, krigging techniques; Construction of heterogeneous reservoir models, constrained to well and seismic data; Upscaling and ranking; Stochastic simulation and modeling; Overview of uncertainty analysis and integrated studies; Case studies.

Drilling Engineering

Rotary Drilling Mechanics; Water and Oil Base Mud; Drill String Design Basics; Drill Bits; Hydraulics; Casing Design Basics; Cement; Well Bore Architecture; Example Well; Pressure Control; Directional Drilling; Down Hole Motors. Special Methods of Drilling (Aerated drilling, Under-balanced drilling, Overbalanced drilling; HPHT Drilling; Variable pressure regime; Plasma drilling, Electrical Drilling, Re-entry drilling; Jet Drilling, Drilling automation. Smart wells Design, Managed Pressure Drilling); Drilling Economics; Computer Application in Drilling;

Engineering Geology & Groundwater Lab

Maps and numerical exercises. Instrumentation in engineering geology (Determination UCS, UTS, Shear strength, permeability, porosity). Determination of pH, Temperature, TDS and other parameters for ground water quality assessment. Graphical representation of supplied ground water quality data. Resistivity survey for ground water. Titration methods to determine the composition of minerals.

Prospecting Lab

1. Apply drift correction to the acquired gravity data
2. Apply diurnal correction to the given magnetic data
3. Interpretation of SP anomaly
4. Interpretation of VES data over two layered earth
5. Travel time distance curve for horizontal refractor
6. Travel time distance curve for horizontal reflector
7. Calculation of Gravity effect due to sphere
8. Calculation of Magnetic effect due to sphere

Geomechanics

Physico-mechanical properties of rocks; Elastic and time dependent behaviour; Constitutive Equations; Elastic moduli;
Poroelasticity: Biot's poroelastic theory for static properties the effective stress concepts;
Theories of rock failure: Elasticity failure mechanics, Compressive strength criteria, shear failure – Mohr Coulomb criterion, Failure criteria based on intermediate stress; Slope Stability;
Stresses around opening: In situ stresses and stress distribution around openings with constant and varying pore-pressure, Borehole along a principal stress direction, Stresses around deviated borehole;
Hydromechanical behavior of fractures: Normal and shear stiffness of rock Fractures; Compaction and Subsidence.

Well Logging

Introduction to well logging; Logging environment; Logging operations: Tools and Methods. Theory and physics of well log measurements; Depth correlation, log interpretation, core log integration, rock typing, and resource determination; Quantitative interpretation of well logs to estimate rock and fluid properties, including porosity, net pay thickness, fluid saturations, fluid type/density, volumetric/weight concentrations of minerals. Well log interpretation in clay free, shaly sand, and organic shale formations.

LAB: Demonstration of computer software for well logging. Interpretation of log data.

Elective I and II

1. Geologic Carbon Sequestration
2. Geothermal Energy
3. Geology of Unconventional Hydrocarbon
4. Geoinformatics for Resource Estimation
5. Geodesy and GPS
6. Ocean Energy and Resources
7. Geotechnical Practice for Waste Disposal
8. Seismic Signal Processing, Imaging and Interpretation

4. Resource and Subject Distribution

4.1 Requirement of faculties for the program

Faculty	Courses	Sem	Status of the Faculty
Faculty 1	Geonumerics (Lab)	1	Available
	Geomechanics	4	
Faculty 2	Geology of Fuels	1	Available
	Engineering Geology and Hydrogeology	2	
	Engineering Geology & Groundwater Lab	3	
	Well Logging (T+L)	4	
Faculty 4	Igneous and Metamorphic Petrology	1	To be recruited
	Petrological Lab	1	
	Advanced Structural Geology	2	
	Structural Geology Lab	2	
Faculty 5	Sedimentary geology and stratigraphy	1	To be recruited
	Basin Formation, Development and Analysis	2	
Faculty 6	Remote sensing and GIS	1	To be recruited
	Economic and mining Geology	2	
	Geostatistical Earth Modelling	3	
	Geostatistical Earth Modelling Lab	4	
Faculty 3	Fundamentals of Geophysics	2	To be recruited
	Geophysical Prospecting	3	
	Prospecting Lab	3	
Faculty 7	Advanced Geomorphology	1	To be recruited
	Natural Hazard and Environmental Geology	3	
PE 1	Introduction to Petroleum engineering	2	Available
PE 2	Drilling Engineering	3	
PE 3	Unconventional Hydrocarbon Resources (Elective)	3	
CHY 1	Geochemistry and Geochemical Prospecting	1	Available
	Geochemistry Lab	2	

Total number of faculty required for the program: 07

Number of Available Faculty: 02

Number of faculty to be recruited: 05

4.2 Requirement of Laboratories

Name of Lab	Place
Computer Programming for Geosciences	IIPE computer lab
Petrological Laboratory	IIPE Class Room
Engineering Geology & Groundwater Lab	IIPE Class Room + AU*
Geochemistry Lab	AU
Structural Geology Lab	IIPE Class Room
Prospecting Lab	AU Geophysics Lab
Well Logging	IIPE Class Room

* only few visits required

4.3 Fieldworks

Geological Fieldwork I (Structural mapping and Geochemical Prospecting) - MOU to be signed with GSI
Geological Fieldwork II (Geophysical prospecting and Well Logging) – MOU to be signed with ONGC/OIL

4.4 Internships

Compulsory internship of minimum 4 weeks in any of the Mining, Oil, Groundwater or geotechnical companies.

M Tech in Energy Engineering

Total Credits of the program: 80
First year credits: 40
Second Year Credits: 40

Proposed List of Subjects for M.Tech in Energy Engineering and Management

First Year

Semester I

Course Code	Course Title	Components			
		L	T	P	C
EN 6001	Energy Storage Fundamentals				3
EN 6002	Renewable Energy Sources-I				3
EN 6003	Energy Systems Modelling & Analysis				3
EN 6004	Fuels & Combustion Technology				3
EN 6005	Energy Management-I				2
EN 6006	Elective I				3
Lab	Energy Systems Laboratory				3
	Seminar				0
Total					20

Elective I

Course Code	Course Title	Components			
		L	T	P	C
	Distributed Generation and Smart grids				3
	Computational Methods in Energy Sector				3
	Safety in Energy system				3
	Transport Phenomena in Energy system				3
	Sustainability in Energy Sector				3
	Energy efficiency in Buildings				3
	Thermal Environmental Engineering				3
	Solar Photovoltaics: Fundamentals, Technologies and Applications				3

More electives can be added later based on the availability of the faculty.

Semester II

Course Code	Course Title	Components			
		L	T	P	C
EN6007	Renewable Energy Sources-II				3
EN6008	Waste to Energy				3
EN6009	Energy Conversion Devices				3
EN6010	Energy Management-II				2
EN6011	Electives II				3
EN6012	Elective III				3
Lab	Non-conventional Energy Systems Lab				3
Total					20

Electives II & Elective III					
		L	T	P	C
	Fuel Cells	3	0	0	3
	Global Energy Future and Energy Economy	3	0	0	3
	Wind Energy Conversion Systems	3	0	0	3
	Optimization in energy sector	3	0	0	3
	Solar Energy in Chemical and Thermal Process	3	0	0	3
	Advance Thermal & Fluids Engineering	3	0	0	3
	Power Systems: Planning, Dynamics & Control	3	0	0	3
	Grid Integration of Renewable energy sources	3	0		3
	Energy Policy Analysis	3	0	0	3
	Heat Transfer in Energy conversion Devices	3	0	0	3
	Advanced Concepts in Solar Cell Technologies	3	0	0	3
	Conventional Energy sources	3	0	0	3

Second Year

Semester 3				
Sl no	Course no	Course Name	Credit	
1	EN6013	Project Phase 1	20	
Semester 4				
Sl no	Course no	Course Name	Credit	
1	EN6014	Project Phase 2	20	

Approval Sought: -

IIPE seeks approval from the senate for the curricula proposed for MSc Applied Geology and of M.Tech Program in Energy Engineering, enclosed in the Annexure 2 A&B

Resolution: -

The senate has accepted the proposal of the curricula for 2 Year MSc in Applied Geology program as it is a well-established course. However, it was suggested that the course structure be referend to Prof. Anindya Sarkar, IIT Kharagpur and an expert from Shell India, for their suggestion if any.

With regard to MTech in Energy Engineering it was discussed in detail by the members and majority of the members informed that a course on Energy engineering is necessary for future. The vision and mission of the IIPE are also focused with the aim of bringing up the energy excellence center. However, some queries were raised regarding the career opportunities of the student opting for the MTech in Energy Engineering course. The difficulty in finding the experts to teach this course has also been discussed. The members informed that the present scenario is gradually shifting towards renewable energy from the conventional energy resources and this will have a good future and the pioneers in this area will have added advantage. After taking all the deliberations in to consideration, the proposal for the curricula is accepted for implementation.

It was also suggested that the detailed syllabus needs to be circulated to the members of the senate by the end of April 2021 for further discussion after receiving reviews from the various academic and industry experts.

Agenda Point No. 3. Change of Syllabus in Mathematics for IIPE Students

Course Code	Course Name	L-T-P	Credits
MA10001	Calculus	3-1-0	4
MA10002	Linear Algebra, Differential Equations & Complex variables	3-1-0	4
MA20001	Transform Calculus & Probability	3-1-0	4
MA20002	Numerical Methods	2-0-2	3
MA20003	Statistical Techniques	3-0-0	3

MA 10001 – Calculus:

Functions of single variable: Sequences in real numbers, limits and continuity of real valued functions on intervals, extreme values of functions in interval, Intermediate value property and differentiation, Mean Value Theorems, Indeterminate forms, Taylor's formula, convergence of series, root test, ratio test, Cauchy condensation test, alternating series, Liebnitz's test, absolute and conditional convergence, power series, radius of convergence, Taylor series, Riemann integration, Riemann integrable functions, Mean value theorems of Integrals, Improper integrals, Beta and Gamma functions and their convergence, comparison test, absolute convergence.

Functions of several variables: Continuity, partial derivatives, directional derivatives and gradient, differentiability, chain rule, tangent plane and normal line, Euler's theorem on homogeneous functions, Taylor's theorem, extreme values, Lagrange multipliers, double and triple integrals, volume and area, change of variables, surface area, surface integrals, line integrals, Green's theorem, vector fields, divergence and curl of a vector field, Stoke's theorem, Divergence theorem.

References:

G. B. Thomas Jr, M. D. Weir and J. R. Hass, *Calculus,* Pearson Education (2009).

Hughes-Hallett et al., Calculus - Single and Multivariable (3rd Edition), John-Wiley and Sons (2003).

James Stewart, Calculus, Thomson (2003).

N. Piskunov, *Differential and Integral Calculus Vol.1-2*, Mir publishers, (1974).

Tom M. Apostol, *Calculus Vol.* 1-2, Wiley, (2007).

S.R. Ghorpade, B.V.Limaye, A course in Calculus and Real Analysis, Springer(2017)

S.R. Ghorpade, B.V.Limaye, A course in Multivariable calculus and Analysis, Springer(2017)

MA 10002 – Linear Algebra, Differential Equations and Complex variables:

Linear Algebra:

Algebra of matrices, Vector spaces, subspaces, linear dependence of vectors, basis and dimensions, linear transforms, matrix representation of a linear transform, rank-nullity theorem, rank and inverse of a matrix, solution of a algebraic equations – consistency conditions, Gaussian elimination and Gauss-Jordon methods, Hermitian, skew Hermitian and unitary matrices, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, diagonalizability, bilinear forms.

Differential equations:

First order differential equations: Exact Equations, integrating factors, Reducible to exact differential equations, linear and Bernoulli's form, Orthogonal trajectories, Lipschitz condition, Picard's theorem, Examples of non-uniqueness.
Homogeneous and non-homogeneous second order ODE's with constant coefficients, Characteristic equation, Linear dependence and Independence, Existence of solutions, Wronskian, method of variation of parameters, general linear differential equations with constant coefficients, Method of undetermined coefficients, Cauchy-Euler equations, System of differential equations.

Complex Variables:

Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral, Cauchy s integral formula, derivatives of analytic functions, Taylor s series, Laurent s series, Zeros and singularities, Residue theorem, evaluation of real integrals.

References:

G. Strang, *Linear Algebra and its applications*
K. Hoffman and R. Kunze, *Linear Algebra*, Pearson publisher.
E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
S.L.Ross, Differential Equations, Third Edition, Wiley-India(2004).
R. V. Churchill, J. W. Brown, Complex Variables and Applications, Mc-GrawHill, (1990).
S. Ponnusamy, H. Silverman, Complex Variables with Applications, Birkhauser,(2006).

MA 20001 – Transform Calculus & Probability:

Laplace Transform: Definition of Laplace transform, linearity property, conditions for existence of Laplace transform, first and second shifting properties, Laplace transform of derivatives and integrals, unit step function, Dirac-delta function and error function, differentiation and integration of transforms, convolution theorem, inversion, periodic functions, evaluation of integrals by Laplace transforms, solution of initial and boundary value problems.

Fourier Series: Orthogonal and Orthonormal functions, periodic functions, representation of a function in terms of orthonormal functions, Fourier series representation of a function and its convergent properties, half range series, sine and cosine series, complex form of a Fourier series, Fourier integral representation of a function, Parseval's identity.

Fourier Transform: Fourier transform, Fourier sine and cosine transforms, linearity, scaling, frequency shifting and time shifting properties, self-reciprocity of Fourier transform, convolution theorem, Applications to boundary value problems.

Probability: Sample space, events, classical, relative frequency and axiomatic definitions of probability, addition rule, conditional probability, multiplication rule, independence, total probability, Bayes 'theorem.

Random variables: Discrete, continuous and mixed random variables, cumulative distribution, probability mass and probability density functions, Bernoulli, Binomial, Geometric, Poisson, Uniform, Exponential, Normal and Gamma distributions.

Functions of random variables, expectation, variance, moments, jointly distributed random variables and joint cumulative probability distribution functions, jointly continuous random variables, independent random variables, covariance, sum of random variables.

References:

R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Narosa publisher

Erwin Kreyszig, *Advanced Engineering Mathematics,* Wiley publisher.

Sheldon Ross, *A first course in probability,* Pearson publisher.

W. Feller, An introduction to Probability theory and its applications

Peter V, O'Neil, Advanced Engineering Mathematics, 6th edition.

MA 20002 – Numerical Methods:

Numerical errors, Error propagation, Taylor's series. convergence, order, and stability.

Finding roots of equations: Bisection, Regula-falsi, Newton-Raphson, secant methods and their convergence. Basic concepts of iteration and solutions.

Interpolation by polynomials: Lagrange and Newton divided differences methods, error of the interpolating polynomial, piecewise linear and cubic spline interpolation.

Numerical differentiation and integration of functions, Rectangle, Trapezoidal and Simpson's rules, Composite rules, error formulae, Gaussian quadrature rules.

Matrices, vectors, Norms, ill-conditioning, System of Linear Equations, Gaussian elimination, Gauss-Jordan method, LU and Cholesky decomposition, Iterative methods: Gauss-Seidel and Gauss-Jacobi, Eigen value problems: power method, QR method, Gershgorin's theorem.

Linear and nonlinear Least Squares, Newton-Raphson Method in two variables.

Numerical Solution of ODE: Taylor's, Euler's, Modified-Euler, Runge-Kutta methods.
Numerical Solutions of PDE: Heat, Wave and Laplace equations
Exposure of software packages like MATLAB/C/C++/Fortran

References:

S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.

K. Atkinson, An Introduction to Numerical Analysis (2nd Edition), John-Wiley & Sons, 1989.

S.S. Sastry, Introductory Methods of Numerical Analysis - Prentice Hall of India

E. Kreyszig, Advanced Engineering Mathematics (8th Edition), John Wiley (1999).

MA 20003 – Statistical Techniques:

Sampling distributions: Chi-square, t and F distributions, random sample, sample mean and sample variance, the central limit theorem, distributions of the sample mean and the sample variance for a normal population.

Estimation: Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for properties, problems.

Testing of Hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of errors, power of the test, the most powerful test and Neyman-Pearson fundamental lemma, tests for one sample and two sample problems for normal population (t, F, Z tests), tests for proportions, Chi-square goodness of fit test and its applications, problems.

Regression Analysis: Simple linear regression (Description of the model, Least squares estimation, properties of the least square estimators, confidence interval and hypothesis testing for the model parameters, correlation); Multiple linear regression model (Description of the model, matrix approach of Least squares, properties of the least square estimators, confidence interval and hypothesis testing for the model parameters).

Design and Analysis of Experiments: Analysis of variance (One-way classification of fixed effect model, comparing variances, pair wise comparison), randomized complete block design, Latin square design, random effect models, Factorial design, blocking and confounding, Nested and split plot design, Examples from chemical process.

References:

1. Sheldon M. Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, Elsevier.
2. J. S. Milton & J. C. Arnold, *Introduction to Probability and Statistics*, McGraw Hill.
3. D C Montgomery, *Design and Analysis of Experiments,* Wiley 2014.
4. Alexander Mood, Franklin Graybill D. Boes, *Introduction to the theory of Statistics*, McGraw Hill.

Approval Sought: -

IIPE seeks approval from the senate the change of Mathematics syllabus as proposed in the Annexure 3.

Resolution: -

The members suggested that during the change of syllabus, the previous syllabus and present syllabus may be sent in a comparison mode. However, it is resolved to implement new syllabus for the improved learning of the students.

accommodate them. Online internships availed by the students would be considered in view of Pandemic Situation for this year as a special case.

However, for doing the offline Internships, it is mandatory to submit the affidavit of being self-risk by the student and his/her parents.

Approval Sought: -

The academic senate is requested to approve the online internships for this academic year, as a special case due to Covid-19 pandemic situation.

Resolution: -

The proposals made by IIPE are approved by the members of the senate.

Agenda Point No. 6. Innovative Research Grant under the Institute Research Grant (IRG)

Research plays an integral role in the pursuit of vision of Indian Institute of Petroleum and Energy (IIPE) for the future. IIPE motivates and encourages new faculty members to become part of this rich heritage of research at the cutting age. In order to enable them setup their independent research facilities and initiate their own research at IIPE, Innovative Research Grant under the Institute Research Grant (IRG) is provided.

The institute shall provide maximum up to **Rs. 25 Lakhs** to newly joined faculty members to acquire equipment and infrastructure pertinent to their research, with an additional amount of Rs**. 3.0 lakh** for consumables, contingency and travel (within India) etc.

The procedure and guidelines for the submission and selection of proposals is mentioned below:

A faculty member will have to submit a research proposal of maximum three years duration in the prescribed format to the Dean/Associate Dean of Research and Development (R&D) within 01 year from date of confirmation. For the faculty joining after January 2021 the deadline for submission will be one year from the date of joining. The grant may not be utilized for foreign travel and manpower; however, a research scholar is expected to be provided by the department.

1. The research proposal should be submitted in the prescribed format along with the summary sheet and biodata to the office of the Dean (R&D).
2. A list of three external experts shall be proposed by the faculty member. From the list provided/from elsewhere the director will nominate 03 reviewers in the order of preference.

3. Dean/Associate Dean (R&D) will communicate the proposal to 02 of the reviewers. The reviewers will be provided a proforma to fill in their comments. The proposal will be sent to the 3rd reviewer if needed.
4. Dean/Associate Dean (R&D) will process the received comments.
5. The shortlisted proposals will be called for presentation before the Approval Committee, within 02 months from the date of receiving the required comments subject to the availability of the experts.
6. The approval committee will be comprising the Director, Dean/ Associate Dean (R&D), Dean/ Associate Dean (Academics), Dean/ Associate Dean (Faculty affairs), and one external expert (to be nominated by the Director).
7. If the proposal is accepted in principle, suggestions made by the approval committee should be incorporated and the revised proposal is to be submitted to the Office of R&D. On receiving the revised proposal, Dean/ Associate Dean (R&D) may forward to the Director for approval of the funds for starting the IRG.
8. After the approval is accorded by the Director, an IRG budget head will be opened by Accounts Section for the respective faculty member. It should clearly state the budget allocation under different categories, such as equipment, consumables, contingency and travel.
9. Heads under non-recurring funds can be interchanged with approval from the Competent authority/Director.
10. All the purchasing norms of the institute have to be followed.
11. The equipment purchased should be entered in the permanent stock register of the institute by Store & Purchase section.
12. Separate stock register has to be maintained by the concerned PI for the contingency items/consumables purchased in the project.
13. The investigator of IRG Project shall mandatorily submit the Annual progress report and Statement of Expenditure.
14. The duration of seed grant project will be for 3 years from the date of approval by the Director. It is the responsibility of the investigator to close the project immediately after 03 years.
15. At the time of closing, the investigator shall submit a detailed Technical Project Report to the Institute, and give a public Seminar at the Institute on the same.
16. The Institute agrees that existing basic facilities for the proposed equipment/work will be provided to the investigator throughout the duration of the project.

SUMMARY SHEET OF PROJECT PROPOSAL SUBMITTED UNDER INNOVATIVE RESEARCH GRANT

1. Name of the Investigator:
2. Designation:
3. Name of the Department/Division:
4. Project Title:
5. Total Cost of the Project:
6. Keywords:
7. Broad Area:
8. Major Disciple:
9. Project Summary, not to exceed 250 words:

PROFORMA FOR SUBMISSION OF PROJECT PROPOSAL
UNDER INSTITUTE RESEARCH GRANT

1. Name of the Investigator:
2. Designation:
3. Name of the Department/Division:
4. Project Title:
5. Total Cost of the Project:
6. Keywords:
7. Broad Area:
8. Major Disciple:
9. Project Summary, not to exceed 250 words (Structured summary containing Background, Novelty, Objectives, Methods and Expected outcomes):

TECHNICAL DETAILS OF PROJECT (seven pages maximum)

10. Introduction
    Background of the proposal
    Current Status (National and International)
    Objectives (in bullet points)
    Methodology
    Expected outcome
11. Work plan with time schedule
12. Future goals that the work proposed herein will lead to
13. References

BUDGET PARTICULARS

A. Non-Recurring (e.g. equipment, accessories, etc. with justification)

S. No	Item	Year 1	Year 2	Year 3	Total

Sub-Total (A) :Rs.

B. Recurring

Expenditure Head	Year 1	Year 2	Year 3	Total
B1. Consumables				
B.2 Contingency				
B.3 Travel				
Sub-Total (B = B.1 + B.2 + B.3): Rs.				
Grand Total (A + B): Rs.				

Declaration from the Investigator

It is certified that

a) The research work proposed herein does not duplicate work already done or being carried out elsewhere.

b) The same project has not been submitted to any other funding agency.

c) If the project involves field trials/experiments/exchange of specimens, etc. involving human subject, I will ensure that ethical clearances would be taken from the Institute Ethical Committee before implementing the project.

d) IPR norms of the Institute will govern any intellectual property arising out of the work undertaken in this project.

Signature of the Investigator

PROJECT ASSESSMENT FORM

To be filled by the reviewers

1. Does the proposal address well-defined scientific questions? Is the proposal focused?

2. Do you think the work plan and methodology proposed against each of the objectives are appropriate? Will they lead to successful outcome?

3. Are there any major/ minor changes required in the proposal?

4. Can the proposed research be accomplished with the requested budget and within the time frame? Is the budget too ambitious or too little?

5. Overall decision with necessary comments:
   a) Recommended in present form
   b) Recommended with few changes
   c) Rejected

Name & Affiliation of the reviewer

Signature & Date

List of reviewers

Proposed by the faculty

1. Name of the Investigator:
2. Designation:
3. Name of the Department/Division:
4. Project Title
5. Names and affiliation of 03 reviewers with contact details

Format for Annual Statement of Accounts

(Period ..... To .....)

1. Sanction Letter No. :
2. Total Project Cost :
3. Date of Commencement of Project :
4. Proposed Date of Completion :
5. Statement of Expenditure :

S.No.	Sanctioned / Heads	Funds Allocated	Expenditure Incurred			Balance as on ( )	Remarks
			I Year	II year	III Year		
1.	**Equipment**						
2.	Consumables						
3.	Contingency						
4.	Travel						
5.	Others (if any)						
	Total						

Signature of Principal Investigator
with date

Signature of Finance Officer
With date

Approval Sought: -

Requested Academic Senate to approve the procedure and guidelines for Innovative Research Grant under the Institute Research Grant (IRG) as enclosed in Annexure 4.

With respect to institute research grant, it was meticulously discussed on how IITs are implementing. With reference to the maximum budget with subdivision of recurring budget to be given to each faculty, the Chairman requested SPOC IIT Kharagpur to give a report in this regard.

In view of the suggestion made by some of the members that the project should be in time with the vision & mission of the institution.

The Chairman requested the academic committee external board members from the industry to be one of the reviewers of the Expert Committee. If they feel that the project submitted in the IRG is not relevant to the subject, they can take the help of some other experts in their industry and send the reports to the Institute.

Resolution: - Based on the discussions held it is resolved to accept the guidelines proposed by DORD. It is also resolved that the subject matter of Rs. 3 Lakhs as revenue budget be taken up after SPOC clarifies the procedure adopted at IIT Kharagpur.

Agenda Point No. 7. Any other item with the permission of the Chair.

As there were no other items for the discussion, the meeting was concluded with Vote of thanks, to the esteemed Academic Senate members.

INDIAN INSTITUTE OF PETROLEUM & ENERGY ★ VISAKHAPATNAM ★

REGISTRAR (I/C)

REGISTRAR
INDIAN INSTITUTE OF PETROLEUM & ENERGY
VISAKHAPATNAM