Scheme of Instruction, Evaluation

and

Syllabi of

B.E. MINING ENGINEERING
(VII & VIII Semesters)
(BATCH 2022-2026)

With effect from Academic Year 2025-26

DEPARTMENT OF MINING ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING

(Autonomous)

Osmania University

Hyderabad – 500 007, TS, INDIA

Estd.1917

Estd.1929

BATCH 2022 - 2026

SEMESTER WISE SCHEMA WITH CREDITS

Scheme of Instruction for BE (Mining Engineering) for 8 Semesters

S. No.	Programme Work-Subject Area	Credits/Semester								Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	Humanities and Social Sciences (HS)	4								**4**
2.	Basic Sciences (BS)	7.5	7.5	3						**18**
3.	Engineering Sciences (ES)	10	11	7	6					**34**
4.	Professional Subjects- Core (PC)		3	13	14	17	14	14		**75**
5.	Professional Subjects-Electives(PE)				3	3	3	3		**12**
6.	Open Subjects-Electives (OE)						3	3		**6**
7.	Project Work, Seminar and/or Internships (PW)			2		2	3	5	6	**18**
9.	Mandatory Programmes (MC) (*Credit*)									
	TOTAL	**21.5**	**21.5**	**25**	**23**	**22**	**23**	**25**	**6**	**167**
8.	Mandatory Programmes (MC) (*Non-Credit*)									
	Contact Hours/ Week	**28**	**25**	**25**	**25**	**22**	**28**	**28**	**21**	

Scheme of Instruction for BE (Mining Engineering) - VII Semester

Sl No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Wk.	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC701 MN	Mine Legislation and Safety	3	-	-	3	3	40	60	3
2	PC702MN	Mine Economics	3	-	-	3	3	40	60	3
3	PC703MN	Mine Planning and Design	3	-	-	3	3	40	60	3
4	PC704MN	Industrial Management	3	-	-	3	3	40	60	3
5	PE IV	PE IV	3	-	-	3	3	40	60	3
6	OE -II	OE II	3	-	-	3	3	40	60	3
PRACTICALS										
7	PC751MN	Seminar	-	-	2	2	3	50	-	1
8	PC752MN	Comprehension	-	-	2	2	2	25	50	1
9	PW761MN	Project Work-I	-	-	6	6	3	50	-	3
10	PW961MN	Internship-II					2	50	-	2
		Total	**18**	**0**	**10**	**28**	**28**	**415**	**410**	**25**

Evaluation of Internship-II Grade: Satisfactory/ Good/ Excellent

CODE	PROFESSIONAL ELECTIVE-IV
PE741MN	Numerical Modelling in Mining
PE742MN	Mine Disasters and Rescue
PE743MN	Marine Mining

CODE	OPEN ELECTIVE-II
OE701BM	Basic Medical Equipment
OE702BM	Artificial Intelligence in Health Care
OE701CE	Green Building Technology
OE702CE	Plumbing Technology
OE701CS	Cloud Computing
OE702CS	Data base Management Systems
OE701EC	Fundamentals of Embedded Systems
OE702EC	Introduction to Internet Of Things
OE701EE	Optimization Techniques
OE702 EE	Non-Conventional Energy Sources
OE701ME	Nano Technology
OE702ME	Start Up Entrepreneurship

Scheme of Instruction for Be (Mining Engineering) – VIII Semester

Sl.No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Week	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	MC I		3	-	-	3	3	40	60	0
2	MC II		3	-	-	3	3	40	60	0
3	MC III		3			3	3	40	60	0
PRACTICALS										
4	PW891MN	Project Work-II	-	-	12	12	-	50	100	6
Total			**9**	**0**	**12**	**21**	**9**	**170**	**280**	**6**

Evaluation of Internship-II Grade: Satisfactory/ Good/ Excellent

MANDATORY COURSE SUBJECTS

Sl. No.	Course Code	Name of the Subject
1.	MC 801CE	ENVIRONMENTAL SCIENCES
2.	MC 802HS	INTELLECTUAL PROPERTY RIGHTS
3.	MC 803HS	ENGLISH FOR TECHNICAL PAPER WRITING
4.	MC 804HS	CONSTITUTION OF INDIA
5.	MC 805HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
6.	MC 806HS	STRESS MANAGEMENT BY YOGA
7.	MC 807 HS	SPORTS

Scheme of Instruction for BE (Mining Engineering) - VII Semester

Sl No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Wk.	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	PC701 MN	Mine Legislation and Safety	3	-	-	3	3	40	60	3
2	PC702MN	Mine Economics	3	-	-	3	3	40	60	3
3	PC703MN	Mine Planning and Design	3	-	-	3	3	40	60	3
4	PC704MN	Industrial Management	3	-	-	3	3	40	60	3
5	PE IV	PE IV	3	-	-	3	3	40	60	3
6	OE -II	OE II	3	-	-	3	3	40	60	3
PRACTICALS										
7	PC751MN	Seminar	-	-	2	2	3	50	-	1
8	PC752MN	Comprehension	2	-	-	2	2	50	-	1
9	PW761MN	Project Work-I	-	-	6	6	3	50	-	3
10	PW961MN	Internship-II					2	50	-	2
		Total	**20**	**0**	**8**	**28**	**26**	**390**	**360**	**25**

CODE	**OPEN ELECTIVE-II**
OE701BM	Basic Medical Equipment
OE702BM	Artificial Intelligence in Health Care
OE702CE	Green Building Technology
OE704CE	Plumbing Technology
OE701CS	Cloud Computing
OE702CS	Data base Management Systems
OE706EC	Fundamentals of Embedded Systems
OE707EC	Introduction to Internet Of Things
OE708EE	Optimization Techniques
OE709EE	Non-Conventional Energy Sources
PC706ME	Nano Technology
OE710ME	Start Up Entrepreneurship

CODE	**PROFESSIONAL ELECTIVE-IV**
PE741MN	Numerical Modelling in Mining
PE742MN	Mine Disasters and Rescue
PE743MN	Marine Mining

Course Code	Course title						Core/PE/OE
PC 701 MN	MINE LEGISLATION AND SAFETY						Core
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives

1. To introduce the history of mining laws, legislation applicable to mining to the students with basic knowledge
2. To teach the Mines Rules, Vocational Training Rules, Mines Rescue Rules etc. and make them aware the necessity of these rules and their importance
3. To make familiarize with Coal Mines Regulations, Metalliferous Mines Regulations and associated technical circulars for safe and systematic extraction of mineral deposits
4. To discuss the electricity rules applicable to open cast and underground mines, Mines and Minerals Act, Mineral Concession Rules, and MCDR, etc.
5. To explain the accident scenario in the mines, accident classification, enquiry reports, Safety Management Plan, etc.

Course Outcomes

After completing this course, the student will be able to:

1. Digest the concept of Mining Laws and Legislation and other acts and bye-laws related to Mining Industry
2. To gain knowledge in the field of Mines Rules, Vocational Training Rules, Mines Rescue Rules and other related acts
3. To acquire knowledge on CMR, MMR, and associated technical circulars together with their applicability and reasons behind the provisions
4. To familiarize the concepts of electricity rules applicable to open cast and underground mines, Mines and Minerals Act and other related aspects
5. To understand the general causes of accidents in mines, their prevention, classification, reporting, occupational diseases, safety management and other related features.

UNIT- I
Introduction to mining laws and legislation, General principles of mining laws, development of mining legislation in India. Procedure for making legislation, The Mines Act, 1952, Bye-laws, Circulars, and standing orders (in brief).

UNIT- II
The Mines Rules, 1955; The Mines Vocational Training Rules, 1966; The Mines Rescue Rules, 1985. The Mines Crèche rules,1966; The Mines Maternity benefit Act, 1961; Payment of Wages Act, 2005; The Employee's (Workmen's) Compensation Act, 2010; NCWB agreement (in brief).

UNIT- III
Coal Mines Regulations, 2017; Metalliferous Mines Regulations, 1961 and the associated technical circulars.

UNIT- IV
Central Electricity Authority Regulations 2010; General provisions of Mines and Minerals (Regulation and Development) Act 1957; The Mineral Concession Rules, 1960; The Mineral Conservation and Development Rules, 1988.

UNIT - V
General cases of accidents in mines and their prevention. Classification of accidents, accident enquiry reports, cost of accidents, occupational diseases. Safety management in mines, role of management, labour, union and government, safety audit, risk identification and management, safety conferences.

TEXT BOOKS
1. The Mines Act, 1952
2. The Mines Rules, 1955
3. The Mines Vocational Training Rules, 1966
4. The Employee's (Workmen’s) Compensation Act, 2010
5. Central Electricity Authority of Regulations 2010
6. Coal Mines Regulations, 2017
7. Metalliferous Mines Regulations, 1961
8. Mines and Minerals (Regulation and Development) Act 1957

REFERENCE BOOKS:
1. Legislation in Indian Mines: A Critical Appraisal vol. 1&2 – Rakesh and Prasad.
2. The Mineral Concession Rules, 1960
3. The Mineral Conservation and Development Rules, 1988.

Course Code	Course title						Core/PE/OE
PC 702 MN	**MINE ECONOMICS**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives:
• Study of estimation and valuation of mineral deposits
• Study of project appraisal
• Study of finance and accounting

Course Outcomes: After completion of course, the students will be able to	
CO-1	The students will have knowledge on estimation and valuation of mineral deposits.
CO-2	They will possess about project appraisal, finance and accounting.

UNIT-I
The Mineral Industry: Economic importance of the mineral industry special features of mineral industry, demand and supply analysis, National Mineral Policy. Mineral resource classification, International Monetary system, Factors affecting mineral price, Kinds of price quotation, Mineral Price Index, Mineral Price.

UNIT-II
Sampling: Definition, purpose, scope, common methods of sampling, types of samples, selection of sampling procedure, errors in sampling. **Estimation of reserves:** Classification of reserves, tenor, grade. Preparation of assay plans, various methods of ore reserve estimation and problems on ore reserves

UNIT-III
Mine Valuation: Principles of Mine valuation, methods, factors affecting mine valuation, life of mine, Hoskold's approach, other approaches; Concepts of cash flow and time value of money; Nominal and effective interest rates, inflation; project evaluation techniques: payback period, Accounting rate of return; Discounted cash flow methods: Net present value (NPV), Internal rate of return, benefit cost ratio, feasibility study, profitability analysis depreciation, problems on mine valuation and depreciation, methods of depreciation and comparison fields of application.

UNIT-IV
Financial Management: Methods of financing industrial enterprises, structure, formation and capitalization. Sources of finance. **Principles of book keeping** as applied to mining industry and accountancy. Balance sheet, profit and loss accounts, Mineral Taxation

UNIT-V
Cost Accounting: Introduction, need for cost accounting, elements of cost, overheads, allocation of over heads, breakeven analysis, Estimation of cost oscalation. **Budget and Budgetary control**: Definition of budget, Principle of budget and budgetary control, types of budgets.

Suggested text books / Reference:
1.Mine and Mineral Economics by Subhash C. Ray
2.Deshmukh RT "Mineral Economics Meera Publishers, Nagpur
3.Chatterjee KK "Mineral Economics Wiley Estern
4.Rubawsky Mineral Economics Elavier Science Pub
5.Sharma N.L. "Mineral Economics

Course Code	**Course title**						**Core/PE/OE**
PC 703 MN	**MINE PLANNING AND DESIGN**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives:
• To introduce the various techniques for mine planning, geotechnical investigation and equipment management.
• To appreciate the modern trends in opencast mines, safety and environment

Course Outcomes: After completion of course, the students will be able to	
CO-1	Understand Pit Planning and related concepts
CO-2	Understand the fundamentals of open pit planning
CO-3	Understand the fundamentals of underground planning
CO-4	Understand the fundamentals of equipment planning
CO-5	Understand the fundamentals of project implementation and monitoring

UNIT I
Introduction: Technical factors in mine planning, methodology of mine planning, short range & long range mine planning, mine modeling, mine simulation systems approach to mine planning based on mine subsystems and their elements, mine plan generation.

UNIT II
Open Pit Mining: Selection of initial mine cuts, location of surface structures, division of mining area into blocks, mine design, bench drainage, geometry, haul roads, slope stability; open pit limits and optimization, calendar plan, production planning, production scheduling, economic productivity indices.

UNIT III
Underground Mining: Location of mine entries, mine and auxiliary, optimization of mine parameters, design of shaft pillars and protective pillars, planning of production capacity, layout of development drives/raises/winzes etc. length of faces, size of panels, etc. planning of support systems, ventilation, layout of drainage system, planning production scheduling and monitoring, selection of Depillaring method, manpower management, economic/productivity indices, techno economic analysis, mine reclamation and design

UNIT IV
Equipment Planning: Latest technological developments in increase in both types and capacities of equipment used in mining operations. Planning and selection of equipment for different mining conditions. Equipment design for optimum drilling and blasting operations. Equipment information, performance, monitoring and expert systems; Innovative mining systems

UNIT V
Project Implementation and Monitoring:
Pre-project activities feasibility report, environmental clearance, detailed project report, sources of funds, import of technology, selection of contracts and contract administration, time management, cost control material management system, project quality assurance, social responsibility, government orders and guidelines. Environmental impact assessment and preparation of environmental management plan. Mine closure plan. preparation of contract for MDO concept: owner and contractor –case study

Text / Reference books:
1. Jayanth Bhattacharya, Principles of Mine Planning-Allied Publishers, Delhi 2003.
2. Hustrulid, W. and Kuchta, M., (eds)., Fundamentals of Open pit Mine Planning and Design, Elsevier, 1995
3. Ehrenburger, V and Fajkos, A., Mining Modeling, Elsevier, 1995.Bawden, W.F., and Archibald. J.F., Innovative Mine Design for the 21st Century Elsevier, 1993.

Course Code	Course title						Core/PE/OE
PC 704 MN	INDUSTRIAL MANAGEMENT						Core
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives:	
1	To provide students with a comprehensive understanding of management principles and theories.
2	To introduce students to operations management principles and their role in optimizing organizational processes
3	To equip students with knowledge and skills in work study and statistical quality control for process optimization and quality assurance
4	To explore contemporary management practices and their relevance in modern organizations

Course Outcomes:	
CO-1	Students will be able to explain the functions of management, analyze different management theories, and recognize the importance of leadership and corporate social responsibility
CO-2	Students will be able to differentiate between different organizational structures, evaluate their advantages and disadvantages, and assess their applicability in modern organizations
CO-3	Students will be able to understand the process of product design, different production systems, factors affecting plant location, and principles of plant layout. They will also be able to apply line balancing techniques and value analysis to improve efficiency
CO-4	students will be able to conduct work study and method study, apply work measurement techniques, and understand the principles of statistical quality control. They will also be able to construct and interpret control charts for variables and attributes

UNIT I - Introduction to Management

Entrepreneurship and organization, Concepts of Management, nature, importance and Functions of Management, Taylor's Scientific Management Theory, Systems Approach to Management, Fayal's Principles of Management: Mayo's Hawthorne Experiments. Management Theories: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Corporate Social responsibility.

UNIT II - Organizational Structures and Types

Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization. Types of Organizations: Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

UNIT III - Operations Management
Operations Management: Objectives- product design process- Process Selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison. Plant layout: Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT IV - Work Study and Statistical Quality Control
Work Study: Introduction, definition, objectives, steps in work study, Method study, definition, objectives, and steps of method study. Work Measurement, purpose, types of study, stop watch methods, steps, key rating, allowances, standard time calculations, work sampling. Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), acceptance Sampling-Single sampling- Double sampling plans-OC curves, Deming's contribution to quality.

UNIT V - Project Management and contemporary practices
Project Management (PERT/CPM): Network Analysis, Programmed Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems). Contemporary Management Practices: Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma, Capability Maturity Model (CMM), Bench marking, Balanced Score card.

Text / Reference books:
Aryasri: Management Science, 4th edition, TMH, 2004.(UNITS I,II,III,IV,V)
Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004. (UNITS I,II)
Kotler Philip & Keller Kevin Lane, "Marketing Management", PHI, 12th edition, 2005
Koontz & Weihrich, "Essentials of Management", TMH, 6th edition, 2005.
Panneerselvam " Production and Operations Management" PHI,2012.
Memoria & S.V. Gauker, "Personnel Management", Himalaya, 25th edition, 2005
Samuel C. Certo, "Modern Management", PHI, 9th edition, 2005.

Course Code	Course title						Core/PE/OE
PE 741 MN	**NUMERICAL MODELLING IN MINING**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives:
• Understand the concepts and principles of elastic and plastic models, including their applications in mining excavations
• Gain proficiency in numerical simulation methods for excavations in mining, such as finite difference methods
• Learn the principles and techniques of finite element methods for structural analysis in mining, including linear and non-linear analysis
• Familiarize with the boundary element method and its applications in mining, including the design of underground structures and prediction of subsidence
• Develop practical skills in utilizing numerical modeling software packages, such as FLAC and ANSYS, for solving engineering problems in mining excavation design and performance analysis

Course Outcomes: After completion of course, the students will be able to	
CO-1	Analyze and evaluate the behavior of elastic and plastic models in the context of mining excavations
CO-2	Apply numerical simulation methods, specifically finite difference methods, to model and analyze excavations in mining
CO-3	Utilize finite element methods to solve structural analysis problems in mining, including linear and non-linear analysis
CO-4	Apply the boundary element method to solve problems related to isotropic and infinite media in the mining industry
CO-5	Demonstrate proficiency in utilizing numerical modeling software packages, such as FLAC and ANSYS, to design and analyze mining excavations and predict subsidence

UNIT I
Introduction to elastic and plastic models: Fundamentals, elastic, plastic, homogeneous and isotropic, non-linear elastic and elastoplastic models Need for numerical modelling in design of excavations in mines; Domain and boundary conditions; Discretization of domain and boundary; Methods of numerical simulation for excavations in mining

UNIT II
Finite difference methods: Concept, formation of mesh element, finite difference patterns, solutions, application to mining Explicit finite difference method; Finite difference equation; Mechanical damping, mechanical time-step determination, solution stability, advantages and

UNIT III
Finite element methods
Concept, discretization, element configuration, element stiffness, assembling elements to form a structural stiffness matrix; Imposing boundary conditions and solving structural equations Elements on assumed displacements, constant strain triangle, isoperimetric formulation, advantages and their limitations., two and three dimensional solutions, linear and non-linear analysis, applications in : ANSYS.

UNIT IV
Boundary element method:
Concept, discretization, formulation, merits, demerits and limitations, different methods of solution for isotropic and infinite media. Commercial Soft Boundary Element Method: Introduction, formulation, advantages and their limitations.

UNIT V
Applications in mines:
Design of underground structures such as accesses of the deposit, pillar during development and depillaring operations, barrier pillar and panel. Performance of long wall powered support. Design of pit and dump in opencast mines. Prediction of subsidence

SUGGESTED READING:

1	Desai, C.S. and Abel, J.F., Introduction to the finite Element Method, Van NostrandRiehokl Co., New York, 1983.
2	Zienkiewicz, O.C., The Finite Element Method in Engineering Science, Tata McGraw Hill 1972.
3	Segerlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, New York, 1987.
4	Mukhopadyay, M., Matrix Finite Element – Computer and Structural Analysis, Oxford and IBH Publishing co., 1984
5	Brown, E.T., (Ed) Analytical and Computational Methods in Engineering and Rock Mechanics, Allen and Unwin, London, 1987.

Course Code	Course title						Core/PE/OE
PE 742 MN	**MINE DISASTER AND RESCUE**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course Objectives

1. To provide students an exposure to mine disasters, classification, causes and their significance for learning its prevention.
2. To gain understanding of approaches to Disaster Risk Reduction in mines, risk assessment, early warning systems and rescue recovery systems.
3. To teach the preparatory arrangements and equipment to combat disasters in mines. Disaster Management Plan, Standard Procedures of Rescue, Rescue equipment apparatus, etc.
4. To familiarize the conduct of Rescue and Recovery in Mines, Logistics, Post Disaster Damage Assessment, Rescue by large diameter holes, Rules and statutory regulations.
5. To explain various case studies of major disasters occurred in Indian mines due to explosions, inundation, rock fall, etc.

Course Outcomes

After completing this course, the student will be able to:

- Know the various facets of disasters in mines, classification, causes and impacts, do's and don'ts during disasters

Understand approaches to disaster risk reduction, risk assessment, early warning systems, disaster management.

- Appreciate preparations and equipment required to handle disasters in mines, rescue trained team, emergency plan and evacuation and standard procedures for rescue and recovery.
- Recognize the conduct of rescue and recovery in mines, leadership, logistics, damage assessment, public participation, court of inquiries, etc.
- Appraise different disasters occurred in India and abroad such as Jitpur Methane Explosion, Rock Burst in KGF, Mahavir Colliery Disaster, Barkot Tunnel Disaster, etc.

UNIT-I

Introduction Introduction to Disasters

Definition: Vulnerability, Hazard, Resilience, and Risks – Disasters: Types of disasters – Classification, Causes, Impacts- - urban disasters, Climate change - Dos and Don'ts during various types of Disasters.

UNIT-II

Approaches to Disaster Risk Reduction

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness. Risk Assessment, how legislation helps in reducing risks in mines, Concept of factor of Safety, Concept of Early Warning Systems in all activities in mines. Flow of information in the disaster management framework, Stakeholders, Rescue recovery setup in mines.

UNIT-III

Preparations and Equipment to combat Disasters in Mines

Rescue preparedness in mines. Rescue trained persons. Roles of different responsible persons. Response and Recovery Phases of Disaster. Disaster Management Plans (Emergency Plan) for mines, Standard procedures for rescue and recovery in various situations in mines.

Rescue Equipment: Self-contained breathing apparatus, short duration self-contained breathing apparatus, Self-Rescuers, Resuscitating Apparatus, first aid and immediate Medical treatments required.

UNIT-IV

Conduct of Rescue and Recovery In Mines

Leadership in the event of Disaster, Response time, Response logistics, Recovery, Post Disaster Damage Assessment, Public Participation, Court of Enquiries, Rescue by Drilling large dia hole. Sailent features of Rescue, Rules and statutory regulations.

UNIT-V

Case studies

Case Studies of Jitpur Methane explosion, Dhori Coal Dust Explosion Disasters, Bumps Disaster in Kolar Gold Fields at Great depth, Chasnulla inundation disaster, Mahabir Colliery Disaster and Silkyara Bendno –Barkot tunnel disaster and its rescue. How these Disasters effected the legislation in Indian mines.

REFERENCES:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

E RESOURCES:

1. https://www.researchgate.net/publication/318339409_Mining_Disasters_-What_lessons_can_be_learnt
2. https://www.researchgate.net/...Disaster...Management/.../279804770_Disaster_Prevention

TEXTBOOK:

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Mines Disasters in India Vol – I and Vol II by NCSM, Dhanbad
4. Mine Disasters and Mine Rescue by M. A. Ramulu, Third edition, published by Orient blackswanpvt ltd., 2018

Course Code	Course title						Core/PE/OE
PE 743 MN	**MARINE MINING**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	3	-	-	-	30	70	**3**

Course objectives:
• A part from land mineral resources, the oceans also contains valuable minerals wealth such as petroleum, natural gas, manganese and other sulfide minerals.
• Knowledge of mining of shallow and deep sea mineral resources required good understanding of the nature of continental shelf, slope ad sea floor, ad mining conditions.
• The mining of minerals from sea, is totally a different technology and required special excavation and extraction equipment.
• The production of oil and natural gas from off-shore areas needs more sophisticated technologies for exploration and oil field development.

Course Outcomes: After completion of course, the students will be able to	
CO-1	Know about Marine environment.
CO-2	Know about Profile of Sea.
CO-3	Know the Exploration methods of Oil and Sea.
CO-4	Know about the Economics and Environmental impact of Ocean mining.

UNIT – I
Introduction to Marine environment. Characteristics of the ocean floor.
UNIT - II
Profile of the sea. Shelf, slope and rise Nature of the deposits of environments.
UNIT - III
Exploration and characterization of inland water. Mineralogical studies of marine sediments and continental slope. Continental shelf and deep sea bed mineral resources. Exploration systems of dissolved and undissolved mineral deposits;
UNIT - IV
Off shore exploration of oil and gas and subsea systems.
UNIT - V
Deep sea bed Mining. Wells and algae for extraction of minerals, Economic & Technologies.
UNIT - VI
Environmental impact of ocean mining. Law of the sea, legal considerations in ocean mining. Course outcome: the new technologies for the extraction of oil and gas production, developments in marine technologies for the extraction of deep seated minerals and future

Suggested Text books:
1. Hartman HL "Introductory Mining Engg" Willey Eastern.
2. Issues of "MARINE MINING" Manjula R.Shyam "Metals from sea bed Prospects of mining poly matallic nodules of India "Oxfod & IBH".

Subject Code: OE701 BM	**BASIC MEDICAL EQUIPMENT (OPEN ELECTIVE)**					
Pre-requisites			**L**	**T**	**P**	**C**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To make the students understand the need for several Biomedical equipment.
2	To make the students understand the operating principles of a wide range of Biomedical Equipment
3	To familiarize students with the design and functional aspects of medical imaging systems and therapeutic devices.
4	To develop the ability to assess the appropriate biomedical equipment needed for specific clinical and therapeutic applications.
5	To enable students to understand the operating principles and clinical use of therapeutic devices like pacemakers, dialysis machines, and lithotripters.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Learn about various physiological parameters, monitoring and recording.
CO-2	Assess the need and operating principle of equipment used in physiotherapy
CO-3	Interpret the working principle and operating procedure and applications of Medical Imaging equipment.
CO-4	Perceive the governing principles and functions of critical care equipments.
CO-5	Learn about the various Therapeutic Equipment used for different applications

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	3	3	-	1	1	1	-	2
CO2	3	2	2	2	2	2	-	1	1	1	-	2
CO3	3	3	3	3	3	2	1	1	2	2	1	3
CO4	3	3	3	2	3	3	1	2	2	2	2	3
CO5	3	2	3	2	3	3	1	2	2	2	2	3

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I

Medical Monitoring and recording: Patient monitoring: System concepts, bedside monitoring systems, central monitors, heart rate and pulse rate measurement. Temperature measurement Blood pressure measurement: Direct and indirect methods. Respiration rate measurement: Impedance pneumograph, Apnoea detectors. Ambulatory monitoring: Arrhythmia monitor

UNIT–II

Physiotherapy and Electrotherapy Equipment: Diathermy machines: Short wave diathermy, Microwave diathermy and ultrasonic diathermy Electro diagnostic/Therapeutic apparatus: Nerve muscle stimulator, Functional electrical stimulator.

UNIT–III
Medical Imaging Equipment: X-Ray machines: Properties and production of X-Rays, X-ray machine, Image Intensifier. X-ray computed tomography: basic principle and construction of the components. Ultrasonic Imaging: Physics of ultrasonic waves, medical ultrasound, and basic pulse echo apparatus. Magnetic Resonance Imaging: Principle, Image reconstruction techniques, Basic NMR components, Biological effects, Merits.

UNIT-IV
Critical Care Equipment: Ventilators: Mechanics of respiration, artificial ventilators, Positive pressure ventilator, Types and classification of ventilators. Drug delivery system: Infusion pumps, basic components, implantable infusion system, closed-loop control in infusion pump. Cardiac Defibrillators: Need for defibrillators, DC defibrillator, Implantable defibrillators, Defibrillator analyzer.

UNIT – V
Therapeutic Equipment: Cardiac pacemakers: Need for cardiac pacemakers, External and implantable pacemakers, types. Dialysis Machine: Function of the kidney, artificial kidney, Dialyzers, Membranes, Hemodialysis machine. Lithotripters: The stone disease problem, Modern Lithotripter systems, extra corporeal shockwave therapy.

SUGGESTED READING:

1	R.S. Khandpur, Hand book of Biomedical Instrumentation, Tata McGraw-Hill, Second Edition, 2014.
2	John G.Webster, Medical Instrumentation Application and design, Wiley India Edition, 2009.
3	Leslie Cromwell,*Biomedical Instrumentation and Measurements, 2nd Edition, Prentice Hall of India,*

Subject Code: OE 702 BM	**ARTIFICIAL INTELLIGENCE IN HEALTH CARE** (OPEN ELECTIVE)					
Pre-requisites			**L**	**T**	**P**	**C**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To introduce students to the fundamentals of Artificial Intelligence (AI) with a focus on healthcare applications.
2	To explore AI techniques in clinical diagnostics and decision-making.
3	To understand the role of AI in medical imaging, disease prediction, patient monitoring, and personalized medicine.
4	To examine ethical, legal, and regulatory considerations in the deployment of AI in healthcare.
5	To enable students to design and evaluate AI-based healthcare solutions for improving patient outcomes and operational efficiency

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Understand and explain the fundamental AI concepts and techniques relevant to healthcare.
CO-2	Apply machine learning and deep learning methods to analyze medical data and assist in clinical decision-making.
CO-3	Analyze AI-based diagnostic tools used in medical imaging and disease prediction.
CO-4	Evaluate the implementation challenges and ethical implications of AI in healthcare systems.
CO-5	Design AI-driven healthcare applications and propose data-driven solutions to real-world health problems.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	2	2	1	2	1	1	-	2
CO2	3	3	3	3	3	2	-	1	2	2	-	2
CO3	3	3	3	2	3	2	-	1	2	2	2	2
CO4	2	2	1	2	2	3	2	3	2	2	2	2
CO5	3	3	3	2	3	3	2	2	3	3	1	3

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I
Introduction to Artificial Intelligence: Definition. AI Applications, AI representation. Properties of internal Representation, General problem solving, production system, control strategies: forward and backward chaining. Uninformed and informed search techniques. A* and AO* Algorithm

UNIT–II
Machine Learning and Deep Learning for Healthcare:Supervised, unsupervised, and reinforcement learning.Classification and regression techniques in clinical datasets.Neural networks, CNNs, RNNs and their applications.Case studies: Diabetes prediction, cancer classification, readmission prediction.Model evaluation: accuracy, precision, recall, ROC curves

UNIT–III
AI in Medical Imaging and Diagnostics: Image processing fundamentals and feature extraction. AI in radiology: X-rays, CT, MRI, Ultrasound. Computer-aided diagnosis systems. Deep learning for medical image segmentation and classification. Real-world tools: Google DeepMind, IBM Watson Health.

UNIT-IV
Natural Language Processing in Healthcare: Basics of NLP and its significance in healthcare**.** Clinical text mining and named entity recognition (NER).Chatbots and virtual health assistants. AI in Electronic Health Record (EHR) processing. Case study: Predictive analysis from clinical notes.

UNIT – V
Ethical, Legal, and Future Perspectives. Ethical concerns: bias, transparency, and ability. Data privacy and security in AI systems. Regulatory aspects: FDA, HIPAA, CDSCO. Human-AI collaboration in clinical settings. Future directions: AI in genomics, telemedicine, and wearable technologies.

SUGGESTED READING:

1	Eugene, Charniak, Drew Mcdermott: Introduction to artificial intelligence.
2	Elaine Rich and Kerin Knight, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill-2008.
3	Mathias Goyen, *Artificial Intelligence in Healthcare: Past, Present and Future*, Elsevier, 2021.
4	Eric Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, Basic Books, 2019
5	Parashar Shah, *AI in Healthcare: A Practical Guide*, BPB Publications, 2021.

OE 701 CE	**GREEN BUILDING TECHNOLOGY**					
Pre-requisites	-		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Exposure to the green building technologies and their significance.
2	Understand the judicial use of energy and its management.
3	Educate about the Sun-earth relationship and its effect on climate.
4	Enhance awareness of end-use energy requirements in the society.
5	Develop suitable technologies for energy management.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand concept of Energy in Buildings, factors on energy usage and Management.
CO-2	Environmental, Air conditioning and Auditory requirement indoors
CO-3	Climate, radiation, wind in connection with Energy
CO-4	End use energy requirements in buildings, concepts of heat gain and thermal performance
CO-5	Energy audit, energy management.

Articulation matrix of Course outcomes with PO's:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	2	3	1	3	3	3	2	1	2	1	3	1	1
CO2	3	2	3		1		3	2	2	2		3	1	2
CO3	2	1	3	1	1	2	3	2	3	1	1	2	1	1
CO4	2	2	3	1	1	3	2	2	2	2			2	2
CO5	3	3	3	2	1	3	3	2	2	2	2	1	2	2

Correlation rating: Low/ Medium/High:1/2/3 respectively

UNIT-I

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

UNIT-II

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement – Auditory requirement.

UNIT-III

Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT-IV

End-use, energy utilization and requirements: Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope-Evaluation of the overall thermal transfer

UNIT-V

Energy management options: Energy audit and energy targeting - Technological options for energy management.

Suggested Readings:

1. Michael Bauer, Peter Mösle and Michael Schwarz, *"Green Building–Guide book for Sustainable Architecture"*, Springer, Heidelberg, Germany, 2010.
2. Norbert Lechner, *"Heating, Cooling, Lighting-Sustainable Design Methods for Architects",* Wiley, New York, 2015.
3. Mike Montoya, *"Green Building Fundamentals* Ⅱ,Pearson, USA, 2010.
4. Charles J.Kibert, *"Sustainable Construction-Green Building Design and Delivery*Ⅱ, John Wiley & Sons, New York, 2008.
5. Regina Leffers, *"Sustainable Construction and Design*Ⅱ, Pearson / Prentice Hall, USA 2009
6. James Kachadorian, *"The Passive Solar House: Using Solar Design to Heat and Cool Your Home",* Chelsea Green Publishing Co., USA, 1997.

OE 702 CE	**PLUMBING TECHNOLOGY**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1.	Understand plumbing components for various systems such as water supply, waste water, high rise buildings
2.	Study various plumbing fixtures materials, tools and equipment
3.	Study the codes and standards in the building industry for plumbing

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Understand and identify the various plumbing related systems, component and types,
CO-2	Ability to understand various plumbing terminology for water supply
CO-3	Ability to understand various plumbing fixtures materials, tools and equipment.
CO-4	Understand about different pumping systems available.
CO-5	Comprehend the importance of codes, the key responsibilities of a plumbing sector and plumber

Articulation matrix of Course outcomes with PO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1		1	3	-	2	2	3	-	1	1	2
CO2	2	2	1		1	3	-	2	2	3	-	1	1	2
CO3	2	1		1	1		1	1	2	2	1	2	1	2
CO4	2	1		1	1		1	1	2	2	1	2	1	2
CO5	1	1		1		2	2		1	1		2		

Correlation rating: Low/ Medium/High:1/2/3 respectively.

UNIT – I

Building Plumbing - Introduction to Plumbing Systems, components of plumbing systems, and basic physics as related to plumbing. Various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.

UNIT – II

Plumbing Terminology: Definitions, use/purpose of Plumbing Fixtures - accessible, readily accessible, aerated fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flushometer valve, flush tanks, lavatories, macerating toilet, plumbing appliances, plumber.
Traps: indirect waste, vent, blow off, developed length, dirty arm, FOG, indirect waste, receptors, slip joints, trap, and vent.
Water supply: angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, ferrule, gate valve, gray water, joints

UNIT– III

Plumbing Fixtures and Fittings: Definitions of plumbing fixtures, fittings, appliances and appurtenances; maximum flow rates, water closets, bidets, urinals, flushing devices, washbasins, bath/shower, toilets for differently abled, kitchen sinks, water coolers, drinking fountain,clotheswasher,dishwasher,mopsink,overflows,strainers,prohibitedfixtures,floor drains, floor slopes, location of valves, hot water temperature controls, installation standard dimensions in plan and elevation.

UNIT – IV

Pumping Systems : Terminology, pump heads, types of Pumps, applications, pump selection, pump characteristics, pumps and motors, pump efficiency, motor efficiency, Hydro Pneumatic Systems(HPS), Zoning, Storm Water and Drainage Pumps, introduction to starters and control panels.

UNIT – V

Codes and Standards: Scope, purpose; codes and standards in the building industry, UIPC-I, NBC and other codes, Local Municipal Laws, approvals, general regulations, standards, water supply, protection of pipes and structures, waterproofing.

Introduction to the Sector and the Job Role:

Overview of the Plumbing Sector- Importance and scope of plumbing in construction and maintenance, career opportunities in plumbing.
Understanding the Job Role of a Plumber – Duties and responsibilities of a plumber, Skills and attributes required for a plumber.
Safety Measures and Regulations –Importance of safety in plumbing, Basic safety regulations and practices.
Tools and Equipment – Introduction to basic plumbing tools and equipment, Proper use and handling of plumbing tools.

Reference books and codes:

- Uniform Illustrated Plumbing Code-India (UIPC- I) published by IPA and IAPMO (India)
- National Building Code (NBC) of India
- IS17650 Part1 and Part2 for Water Efficient Plumbing Products
- Water Efficient Products-India (WEP-I) published by IPA and IAPMO (India)
- Water Efficiency and Sanitation Standard (WE. Stand) published by IPA and IAPMO (India)
- Water Pollution, Berry, CBS Publishers.
- 'A Guide to Good Plumbing Practices', a book published by IPA.
- Elements of Water Pollution Control Engineering, O.P.Gupta, Khanna Book Publishing, New Delhi
- Plumbing Engineering.Theory,DesignandPractice,S.M.Patil,1999
- Water supply and sewerage system– G. Birdie

Learning Website:

1. www.nptel.co.in
2. https://ndrfandcd.gov.in/Cms/NATIONA0LBUILDINGCODE.aspx

CODE **OE701CS**	**CLOUD COMPUTING** **Open Elective**					
Pre-requisites	NIL		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To introduce basic concepts cloud computing and enabling technologies
2	To learn about Auto-Scaling, capacity planning and load balancing in cloud
3	To introduce security, privacy and compliance issues in clouds
4	To introduce cloud management standards and programming models

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the basic approaches and Core ideas of Cloud Computing.
CO-2	Understand the Challenges and approaches in the management of the Cloud environments.
CO-3	Familiarize with advanced paradigms and solutions necessary for building and managing modern Cloud environments.
CO-4	Envision use of Cloud environment in Enterprise.

UNIT– I
Introduction, Benefits and challenges, Cloud computing services, Resource Virtualization, Resource pooling sharing and provisioning.

UNIT – II
Scaling in the Cloud, Capacity Planning, Load Balancing, File System and Storage,

UNIT – III
Multi-tenant Software, Data in Cloud, Database Technology, Content Delivery Network, Security Reference Model, Security Issues, Privacy and Compliance Issues

UNIT – IV
Portability and Interoperability Issues, Cloud Management and a Programming Model Case Study, Popular Cloud Services

UNIT –V
Enterprise architecture and SOA, Enterprise Software , Enterprise Custom Applications, Workflow and Business Processes, Enterprise Analytics and Search, Enterprise Cloud Computing Ecosystem.

Suggested Reading:

1	Cloud Computing - Sandeep Bhowmik, Cambridge University Press, 2017.
2	Enterprise Cloud Computing - Technology, Architecture, Applications by Gautam Shroff, Cambridge University Press, 2016.
3	Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, ―Distributed and Cloud Computing From Parallel Processing to the Internet of Things‖, Elsevier, 2012.
4.	https://aws.amazon.com/about-aws/
5.	https://cloud.google.com/why-google-cloud?hl=en
6.	https://azure.microsoft.com/en-gb/

Subject Code: OE702CS	**DATA BASE MANAGEMENT SYSTEMS** (OPEN ELECTIVE)					
Pre-requisites			**L**	**T**	**P**	**C**
			3	**-**	**-**	**3**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:
• To introduce three schema architecture and DBMS functional components. • To understand the principles of ER modeling and design. • To learn query languages of RDBMS. • To familiarize theory of serializablity and implementation of concurrency control, and recovery. • To study different file organization and indexing techniques.
Course Outcomes:
Student will be able to:
1. Understand the mathematical foundations on which RDBMS are built.
2. Model a set of requirements using the Entity Relationship Model (ER), transform into a relational model, and refine the relational model using theory of Normalization.
3. Develop Database application using SQL and Advanced SQL.
4. Understand the working of concurrency control and recovery mechanisms in RDBMS.
5. Use the knowledge of indexing and hashing to improve database application performance.

Unit 1: Introduction to DBMS:
• **Introduction:** Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Data Base Users and Administrators. • **Introduction to the Relational Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagram, Relational Query Languages, The Relational Algebra

Unit 2: Data Models and Database Design:
• **Entity-Relationship (ER) Model**: The Entity-Relational Model, Complex Attributes, Mapping Cardinalities, Primary key, Removing Redundant Attribute in Entity Set, Reducing E-R diagrams to Relational Schemas, Extended E-R features, Entity-Relationship Design Issues, Alternative Notations for Modelling Data. • **Relational Model**: Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, algorithms for Decomposition using Functional Dependencies, Decomposition Using multivalued Dependencies, Atomic Domains and First Normal Form, Database-Design process, Modelling Temporal Data

Unit 3: SQL and Querying:

- **SQL Basics**: Data definition, data manipulation, and data control languages. functions in sql (single row and multirow& conversion functions), Creating Tables, keys, integrity constraints (column level and table level)
- **Advanced SQL**: Joins, subqueries, aggregate functions, and views. Synonyms
- **Stored Procedures and Triggers**: Concepts and usage.

Unit 4: Transaction Management and Concurrency Control:

- **Transaction Concepts**: Transaction Concept, transaction states, A simple transaction Model, Implementation of Atomicity and Durability, Implementation of Isolation, Serializability (view Serializability, conflict serializability)
- **Concurrency Control**: Locking mechanisms, Lock-based protocol, Timestamp-Based Protocol, Validation Based Protocol, Multiple Granularity, deadlock handling.
- **Recovery Techniques**: Failure Classification, Storage Structure, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-Volatile Storage, High Availability Using Remote Backup Systems, ARIES, Early Lock Release and Logical Undo Operations, Recovery in Main-memory Databases.

Unit 5: Indexing and Hashing:

- **Database-System Architectures:** Centralized Database Systems, Server System Architectures, Parallel Systems, Distributed Systems, Transaction Processing in Parallel and Distributed Systems, Cloud-Based Services.

- **Introduction to Big Data:** Big Data Storage Systems, The MapReduce Paradigm, Beyond MapReduce, Algebraic Operations, Streaming Data, Graph Databases

Reference Books:

1) Database System Concepts Seventh Edition Abraham Sliberschantz, Henry f. Korth,S. Sudarshan, 7th Edition, 2024.
2) Rama krishnan, Gehrke, "*Database Management Systems"*, McGraw-Hill International Edition, 3rd Edition, 2003.
3) Elma sri, Nava the, Somayajulu, "*Fundamentals of Database Systems"*Pearson Education, 4th Edition, 2004.

OE 701 EC	**FUNDAMENTALS OF EMBEDDED SYSTEMS**					
Pre-requisites	Computer Organization, Micro Processors		**L**	**T**	**P**	**C**
			3	**-**	**-**	**3**
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1	Learn basics of Computer architecture, its working and types.
2	Learn basics of Embedded Systems and their applications.
3	Learn interfacing various components with Embedded Systems

Course Outcomes:	
On completion of this course, the student will be able to :	
1	Learn about the general principles of computer architecture
2	Understand the working of a simple embedded system and embedded system applications
3	Understand the hardware aspects of embedded systems
4	Understand the sensors, ADCs and actuators used in embedded systems
5	Understand the real world examples of embedded systems

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2											1
CO2	2											1
CO3	2											1
CO4	2	1										2
CO5	3	2										2

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I
Basics of computer architecture and the binary number system: Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity.

UNIT–II
Introduction to embedded systems: Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple embedded system, figure of merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems, current trends.

UNIT–III
Embedded systems-The hardware point of view: Microcontroller unit(MCU), a popular 8-bit MCU, memory for embedded systems, low power design, pull up and pull down resistors

UNIT-IV
Sensors, ADCs and Actuators: Sensors: Temperature Sensor, Light Sensor, Proximity/range Sensor; Analog to digital converters: ADC Interfacing; Actuators Displays, Motors, Opto couplers/Opto isolators, relays.

UNIT – V
Examples of embedded systems: Mobile phone, automotive electronics, radio frequency identification (RFID), wireless sensor networks (WISENET), robotics, biomedical applications, brain machine interface.

Suggested Reading:

1	Lyla B Das, Embedded systems: An Integrated Approach, 1st Ed., Pearson, 2013
2	Raj Kamal, Embedded Systems – Architecture, Programming and Design, 2nd Edition, TMH, 2008
3	Shibu, K.V., Introduction to Embedded Systems, 1st Ed., TMH, 2009
4	Kanta Rao B, Embedded Systems, 1st Ed., PHI
5	Frank Vahid & Tony Givargis, Embedded System Design, 2nd Edition, John Wiley.

OE 702 EC	**INTRODUCTION TO INTERNET OF THINGS**					
(OPEN ELECTIVE)						
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	To understand the concepts of the Internet of Things and be able to build IoT applications
2	To learn the programming and use of Arduino and Raspberry Pi boards Design And detail the deep beams.
3	To study about various IoT case studies and industrial applications.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Known basic protocols in sensor networks.
CO-2	To Know the Architecture and Protocols of IoT.
CO-3	Python programming and interfacing for Raspberry Pi.
CO-4	Interfacing sensors and actuators with different IoT architectures.
CO-5	Compare IOT Applications in Industrial &real world

Course outcome	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**
CO-1	2	1	2	2	2
CO-2	2	3	3	2	1
CO-3	3	2	3	3	2
CO-4	3	2	2	2	1
CO-5	3	2	3	3	3

UNIT–I

Introduction to the Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols.

UNIT–II

IoT Architecture: Physical and Logical design of IoT, IoT frameworks, IoT Protocols – MQTT, COAP, 6LOWPAN

UNIT–III
Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi..

UNIT–IV
IoT applications in home, Infrastructures, Buildings, Security, Industries, Home appliances, other IoT electronic equipments.

UNIT–V
Prototyping and Programming for IoT: Sensors, Actuators, Micro Controllers, SoC, Choosing a platform, prototyping hardware platforms- Arduino, Raspberry Pi, Prototype in Physical design- Laser Cutting, 3D-Printing, CNC milling, techniques for writing Embedded code

Suggested Reading:

1	Raj Kamal, "Internet of Things – Architecture and Design Principles", McGraw Hill Education Pvt. Ltd., 2017
2	"Makesensors":Terokarvinen,kemo,karvinenandvilleyvaltokari,1stedition, maker media, 2014.
3	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
4	Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madisetti, Universities Press, 2015
5	Rao, M. (2018). Internet of Things with Raspbery Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd
6	Internet of Things and Data Analytics, HwaiyuGeng, P.E, Wiley Publications, 2017

Course Code	Course Title					Course Type	
OE701EE	**OPTIMAZATION TECHNIQUES**					**Elective**	
Prerequisite	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**	**Credits**	
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To understand the need and basic concepts of operations research and classify the optimization problems.
2	To study about the linear programming and non-linear programming concepts and their applications.
3	To understand various constrained and un-constrained optimization techniques and their applications.
4	To understand the concepts and implementation of Genetic Algorithms to get the optimum solutions.
5	To study the concepts of Metaheuristics Optimization techniques.

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Analyze any problem of optimization in an engineering system and able to formulate a mathematical model to the problem and solving it by the techniques that are presented.
CO-2	Solve problems of L.P. by graphical and Simplex methods.
CO-3	Apply various constrained and un-constrained optimization techniques for the specific problems.
CO-4	Implement the Genetic Algorithms to solve the for optimum solution.
CO-5	Understand the concepts to use the Metaheuristics Optimization techniques.

Articulation matrix of Course Outcomes with POs:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	2	2	2	1	-	-	-	-	1	2	3	2
CO 2	3	3	2	2	2	-	-	-	-	-	-	1	2	2
CO 3	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO 4	3	3	3	3	3	-	-	-	2	1	1	2	3	3
CO 5	3	2	2	2	3	-	-	-	-	-	1	2	3	3

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I

Introduction: Definitions, Characteristics, Objective function, Classification of optimization problems, Engineering applications and limitations. Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints and Multivariable Optimization with Inequality Constraints: Kuhn–Tucker Condition.

UNIT–II

Linear Programming: Definitions and Formulation of the LPP, Construction of L.P. Models, Slack and surplus variables, Standard form, Canonical form and matrix form of LP Problems. Artificial Variables, solution by the Big-M method, Duality principle, Dual problems and numerical problems.

UNIT–III

Random Search Methods Concepts: Direct Search Methods - Univariate Method, Gradient of a Function, Indirect Search Methods - Gradient of a Function, Steepest Descent (Cauchy) Method, Newton’s Method.

UNIT-IV
Binary Genetic Algorithm: Genetic Algorithms Natural Selection on a Computer, Components of a Binary Genetic Algorithm. Selecting the Variables and the Cost Function. Variable Encoding and Decoding, The Population, Natural Selection, Selection, Mating. Mutations, the Next Generation and Convergence, Components of a Continuous Genetic Algorithm.

UNIT – V
Metaheuristics Optimization: Concepts of Simulated Annealing, Theoretical approaches, Advantages and disadvantages, applications, Ant Colony Algorithms - Introduction, Collective behavior of social insects, Formalization and properties of ant colony optimization.

Suggested Reading:

1	Rao, S.S. (2009). "Engineering Optimization: Theory and Practice." John Wiley & Sons, Inc.
2	Taha, H.A. (2008). "Operations Research, Pearson Education India." New Delhi, India.
3	Randy L. Haupt and Sue Ellen Haupt, "Practical genetic algorithms" second edition, a John Wiley & sons, inc., publication -2004.
4	Sharma J.K. (2013). "Operation Research: Theory and Applications." Fifth Edition, Macmillan Publishers, New Delhi, India.
5	J. Dreo A. Petrowski, P. Siarry E. Taillard. "Metaheuristics for Hard Optimization" Springer.

Course Code	Course Title						Course Type
OE702EE	**Non-Conventional Energy Sources**						**Elective**
Prerequisite	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**		**Credits**
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	To understand the different types of energy sources.
2	To understand the need of non-conventional energy sources and their principles.
3	To understand the limitations of non-conventional energy sources.
4	To outline division aspects and utilization of renewable energy sources for diriment application.
5	To analyze the environmental aspects of renewable energy resources.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Know the different energy resources and need of renewable energy resources.
CO-2	Understand the concepts of working of fuel cell systems along with their applications.
CO-3	Describe the use of solar energy and the various components and measuring devices used in the energy production and their applications.
CO-4	Appreciate the need of Wind Energy and their classification and various components used in energy generation and working of different electrical wind energy system.
CO-5	Understand the concept of OTEC technology, Biomass energy resources and different types of biogas Plants used in India.

Articulation matrix of Course Outcomes with POs:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2	-	-	2	-	2	-	-	-	-	1	3	2
CO 2	3	3	-	-	2	-	2	-	-	-	-	1	2	2
CO 3	3	3	-	2	3	-	2	-	-	-	-	2	3	3
CO 4	3	2	-	2	2	-	3	-	-	-	-	2	3	3
CO 5	2	2	-	-	2	-	3	-	-	-	-	2	2	3

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

UNIT–I
Review of Conventional and Non-Conventional energy sources, Need for non-conventional energy sources Types of Non-conventional energy sources, Fuel Cells, Principle of operation with special reference to H2O2 Cell, Classification and Block diagram of fuel cell systems, Ion exchange membrane cell, Molten carbonate cells, Solid oxide electrolyte cells, Regenerative system, Regenerative Fuel Cell, Advantages and disadvantages of Fuel Cells, Polarization, Conversion efficiency and Applications of Fuel Cells.

UNIT–II
Solar energy, Solar radiation and its measurements, Solar Energy collectors, Solar Energy storage systems, Solar Pond, Application of Solar Pond, Applications of solar energy.

UNIT–III
Wind energy, Principles of wind energy conversion systems, Nature of wind, Power in the Wind, Basic components of WECS, Classification of WECS, Site selection considerations, Advantages and disadvantages of WECS, Wind energy collectors, Wind electric generating and control systems, Applications of Wind energy, Environmental aspects.

UNIT–IV
Energy from the Oceans, Ocean Thermal Electric Conversion (OTEC) methods, Principles of tidal power generation, Advantages and limitations of tidal power generation, Ocean waves, Wave energy conversion devices, Advantages and disadvantages of wave energy, Geo- thermal Energy, Types of Geo-thermal Energy Systems, Applications of Geo-thermal Energy.

UNIT–V
Energy from Biomass, Biomass conversion technologies / processes, Photosynthesis, Photosynthetic efficiency, Biogas generation, Selection of site for Biogas plant, Classification of Biogas plants, Details of commonly used Biogas plants in India, Advantages and disadvantages of Biogas generation, Thermal gasification of biomass, Biomass gasifies.

Suggested Reading:

1	Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2	M.M.El-Wakil, Power Plant Technology. McGraw Hill, 1984.

Course Code	Course Title				Course Type		
OE701ME	NANO TECHNOLOGY OPEN ELECTIVE -II				Elective		
Prerequisite	Contact hours per week			Duration of SEE (Hours)	Scheme of Evaluation	Credits	
	L	T	P		CIE	SEE	
	3	-	-	3	40	60	3

Course Objectives:

- To familiarize Nano materials and technology.
- To understand Nano structures, fabrication and special Nano materials.

Course Outcomes:

UNIT-I

Introduction: Nanoscale, Properties at Nanoscale, advantages and disadvantages, importance of Nano Technology, Bottom-up and Top-down approaches, challenges in Nano Technology.

UNIT-II

Materials of Nano Technology: Introduction-Si-based materials, Ge-based materials, Smart materials, metals, Ferroelectric materials, Polymer materials, GaAs & InP (III-V) group materials, Nano tribology and Materials, Principles and analytical techniques of XRD, SEM, TEM and STM/AFM.

UNIT-III

Nano Structures: Zero dimensional Nano structure (Nano Particles)- Synthesis procedure, characterization techniques, properties and applications of Nano Particles One dimensional Nano structures (Nano Wires, Nano Tubes)- Various Synthesis procedure, characterization procedure and principles involved, properties and applications of Nano Wires, Types of Nano Tubes, Synthesis procedure, characterization properties and applications of Nano Tubes.

UNIT-IV

Nano Fabrication: Introduction, Basic fabrication techniques (Lithography, thin film deposition, and doping) MEMS fabrication techniques, Nano fabrication techniques (E-beam Nano-imprint fabrication, Epitaxy and strain engineering, Scanned probe techniques).

UNIT-V

Special Nano Materials: Nano Composites: Introduction, Synthesis procedures, various systems (metal-polymer, metal- ceramics and polymer-Ceramics), Characterization procedures, applications. Nano Biomaterials: Introduction, Biocompatibility, anti-bacterial activity, principles involved, applications.

Suggested Reading:

1. A.K.Bandyopadyay, Nano Materials, New Age Publications, 2007.
2. T. Pradeep, Nano: The Essentials: Understanding Nanoscience and Nanotechnolgy, Tata McGraw-Hill, 2008.
3. Carl. C. Koch, Nano Materials Synthesis, Properties and Applications, Jaico Publishing House,2008.
4. Willia Illsey Atkinson, NanoTechnology, Jaico Publishing House, 2009.

Course Code	Course Title				Course Type		
OE702ME	**START UP ENTREPRENEURSHIP (Open Elective-II)**				**Elective**		
Prerequisite	**Contact hours per week**			**Duration of SEE (Hours)**	**Scheme of Evaluation**	**Credits**	
	L	**T**	**P**		**CIE**	**SEE**	
	3	**-**	**-**	**3**	**40**	**60**	**3**

Course Objectives:

- To motivate students to take up entrepreneurship in future
- To learn nuances of starting an enterprise & project management
- To understand the behavioural aspects of entrepreneurs and time management

Course Outcomes: Student will

1. Understand the behavioural aspects of entrepreneurs and time management
2. Creative thinking and transform ideas into reality
3. Importance of innovation in new business opportunities
4. Create a complete business plan and workout the budget plan.
5. write a project proposal with budget statement

UNIT I

Creativity & Discovery: Definition of Creativity, self test creativity, discovery and delivery skills, the imagination threshold, building creativity ladder, Collection of wild ideas, Bench marking the ideas, Innovative to borrow or adopt, choosing the best of many ideas, management of trade-off between discovery and delivery, sharpening observation skills, reinventing self, Inspire and aspire through success stories

UNIT II

From Idea to Start-up: Introduction to think ahead backward, Validation of ideas using cost and strategy, visualizing the business through value profile, activity mapping, Risks as opportunities, building your own road map

UNIT III

Innovation career lessons: Growing & Sharing Knowledge, The Role of Failure in Achieving Success, creating vision, Strategy, Action & Resistance: Differentiated Market Transforming Strategy; Dare to Take Action; Fighting Resistance; All About the start-up Ecosystem; Building a Team; Keeping it Simple and Working Hard.

UNIT IV

Action driven business plan: Creating a completed non-business plan (a series of actions each of which moves your idea toward implementation), including a list of the activities to be undertaken, with degrees of importance (scale of 1 to 3, where 1 is 'most important'). A revision of the original product or service idea, in light of information gathered in the process, beginning to design the business or organization that will successfully implement your creative idea. Preparing an activity map.

UNIT V

Start-up financing cycle: Preparing an initial cash flow statement, showing money flowing out (operations; capital) and flowing in. Estimate your capital needs realistically. Prepare a bootstrapping option (self financing). Prepare a risk map. Prepare a business plan comprising five sections: The Need; The Product; Unique Features; The Market; Future Developments. Include a Gantt chart (project plan – detailed activities and starting and ending dates); and a project budget.

Suggested Readings:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project – Planning, Analysis, Selection, Implementation and Review", TataMcGraw-Hill Publishing Company Ltd., 1995.
3. B. Badhai, "Entrepreneurship for Engineers", Dhanpath Rai & Co., Delhi, 2001.
4. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, " Entrepreneurship", Tata McGRaw Hill Edition, 2002.

Course Code	Course title						Core/PE/OE
PC 751 MN	**SEMINAR**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	2	-	-	-	50		**1**

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1	Identify appropriate topic of relevance.
2	Update literature on technical articles of selected topic and develop comprehension.
3	Prepare a technical report.
4	Deliver presentation on specified technical topic.

Course Outcomes:	
On completion of this course, the student will be able to :	
CO-1	Review literature on technical articles and develop comprehension.
CO-2	Recognize appropriate topic of relevance
CO-3	Prepare review repot of literature studied
CO-4	Write a technical report.
CO-5	Give presentation on specified technical topic

At least two faculty members will be associated with the seminar presentation to evaluate and award marks.

Course Code	Course title						Core/PE/OE
PC 752 MN	**COMPREHENSION**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	2	25	50	**1**

Course Objectives:	
1	To revise and recall major mining subjects covered in previous semesters
2	To introduce different competitive exams regarding job opportunities in India and abroad
3	To introduce different competitive exams regarding higher studies in Indian and abroad universities

Course Outcomes:	
CO-1	Students will be able to recall the prepare for mining competitive exams
CO-2	Students will be able to review various job opportunities other than mining
CO-3	Students will be able to review various higher studies opportunities in India and Abroad

UNIT-I
Revision of Mining Geology, Mine Development, Surveying

UNIT-II
Revision of Engineering mechanics, Rock mechanics, Ground control

UNIT-III
Revision of Mining Methods –Surface, U/G Coal, U/G Metal and Machinery, Surface Environment, Mine Ventilation and Underground Hazards

UNIT-IV
Revision of Mineral Economics, Mine Planning, Systems Engineering

UNIT-V
Introduction of mining competitive exams for higher studies and mining job opportunities in India and abroad, competitive exams for State and Central government jobs other than mining jobs, different carrier opportunities and entrepreneurship.

Course Code	Course title						Core/PE/OE
PW 761 MN	**PROJECT WORK-I**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	4	-	-	-	50		**3**

Course Objectives:	
1	To enhance practical and professional skills.
2	To familiarize tools and techniques of systematic Literature survey and documentation
3	To expose the students to industry practices and team work.
4	To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:	
CO-1	Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems
CO-2	Evaluate different solutions based on economic and technical feasibility
CO-3	Effectively plan a project and confidently perform all aspects of project management
CO-4	Demonstrate effective written and oral communication skills

Pre requisites:

1. Able to define Problem with specifications
2. Relevant Literature survey, familiarity with research journals
3. Critically evaluate various available techniques to solve a particular problem
4. Able to Plan the work, prepare required graphs, bar (activity) charts and analyses the results and arrive at a solution
5. Prepare and present results in a scientific manner (Presentation - oral and written)
6. The department can initiate the project allotment procedure at the end of VI semester and finalize it in the first two weeks of VII semester.
7. First 4 weeks of VII semester will be spent on special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R & D institutions.
8. The objective of these preliminary talks will be to expose the students to real life practical problems and methodology to solve the technical problems.
9. last week of the semester which should be strictly adhered to.

Each student will be required to:

1. Submit a one-page synopsis before the seminar for display on notice board.
2. Give a 20 minutes' presentation followed by 10 minutes' discussion.
3. Submit a technical write-up on the talk.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above

.

Course Code	Course title						Core/PE/OE
PW 961 MN	**Internship II**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	-	50		**2**

Course Objectives:	
1	To give an experience to the students in solving real life practical problems with all its constraints.
2	To give an opportunity to integrate different aspects of learning with reference to real life problems.
3	To enhance the confidence of the students while communicating with industry engineers and give an
4	opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

Course Outcomes: Student will be	
CO-1	Able to design/develop a small and simple product in hardware or software.
CO-2	Able to complete the task or realize a pre-specified target, with limited scope, rather than taking up a complex task and leave it.
CO-3	Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to pre-specified criteria.
CO-4	Able to implement the selected solution and document the same.
CO-5	Able to write a technical report and present it to appropriate audience

- Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry, R & D Organization / National Laboratory for a period of 8 weeks.

- This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide. After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department. Award of sessional marks are based on the performance of the student at the work place and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.
- *Students after undergoing summer internship of 6 Weeks duration at the end of semester VI the grades Excellent, Good, Average will be allotted after evaluation in VII semester.

Scheme of Instruction for Be (Mining Engineering) – VIII Semester

S.No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/ Week	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
THEORY										
1	MC I		3	-	-	3	3	40	60	0
2	MC II		3	-	-	3	3	40	60	0
3	MC III		3			3	3	40	60	0
PRACTICALS										
4	PW891MN	Project Work-II	-	-	12	12	-	50	100	6
			9	**0**	**12**	**21**	**9**	**170**	**280**	**6**

MANDATORY COURSE SUBJECTS

Sl. No.	Course Code	Name of the Subject
1.	MC 801CE	ENVIRONMENTAL SCIENCES
2.	MC 802HS	INTELLECTUAL PROPERTY RIGHTS
3.	MC 803HS	ENGLISH FOR TECHNICAL PAPER WRITING
4.	MC 804HS	CONSTITUTION OF INDIA
5.	MC 805HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
6.	MC 806HS	STRESS MANAGEMENT BY YOGA
7.	MC 807 HS	SPORTS

MC-I **MC 801 CE**	**ENVIRONMENTAL SCIENCE**					
Pre-requisites	Water Resources Engineering Subjects		**L**	**T**	**P**	**C**
			3	-	-	0
Evaluation	**SEE**	60Marks	**CIE**		40Marks	

Course Objectives:	
The course is taught with the objectives of enabling the student to:	
1.	Comprehend the need of environmental science, ethics and issues
2.	Realize the availability and utilization of various natural resources
3.	Illustrate the characteristics and functions of Ecosystem
4.	Study various environmental pollution effects, prevention and control acts
5.	Understand the concepts of Biodiversity and its conservation needs

Course Outcomes:	
On completion of this course, the student will be able to:	
CO-1	Application and awareness of various environmental issues for sustainable society
CO-2	Acquaintance with utilization of various natural resources
CO-3	Capacity to understand and practice for sustainability of ecosystem.
CO-4	Knowledge of social and environment related issues and their preventive measures
CO-5	Ability in conserving and protecting the biodiversity

Articulation matrix of Course outcomes with PO's:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO1 1	PO1 2	PSO 1	PSO2
CO1	3	2		2		1	3	1	2	1		3	1	2
CO2	3	2		2		1	3	2	1	1		3	1	2
CO3	3	2		2		1	3	1	1	1		1	1	1
CO4	3	2		2		1	3	1	1	1		3	1	1
CO5	3	2		2		1	3	1	1	1		1	1	1

Correlation rating: Low/ Medium/High:1/2/3 respectively.

UNIT-I

Multidisciplinary nature of Environmental studies:

Definition, scope and importance, Need for public awareness, Environmental ethics: issues and possible solutions, Global Warming and Climate change, Acid rain, Ozone layer depletion. Environment and human health, Population growth, Sustainable development and SDGs

UNIT-II

Natural Resources:

Types of Natural Resources, Role of individual in conservation of natural resources, Equitable use of resources for sustainable life styles, Natural resources and associated problems.

Land Resources: Land as a resource, land degradation, soil erosion and desertification.

Forest resources: Use and Overexploitation, Deforestation, Timber Extraction, Mining, Dams, and their Effects on Forests and Tribal People

Water resources: Water Resources: Use and Overutilization of Surface and Ground Water, Floods, Drought, Conflicts over Water, Dams – Benefits and problems

Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and using Mineral Resources

Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Energy Resources.

UNIT-III

Ecosystems:

Concept of an Ecosystem, Types, Structure and function of an ecosystem, Producers, consumers, decomposers. Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and functions - Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-IV

Environmental Pollution:

Definition, Causes, effects and control measures - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards,

Environmental Protection: Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife conservation and protection act, Forest conservation and protection act, Role of an individual's, communities and NGOs in prevention of pollution

Solid waste Management: Causes, effects and control measures of urban and industrial wastes

UNIT-V

Biodiversity and its Conservation:

Definition: genetics, species and ecosystem diversity, Spatial Patterns of Species Richness, Shannon's, Simpson's Diversity Index. Bio-geographically classification of India. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local level. India as a mega diversity nation. Hot-spots of biodiversity,
Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts. Endangered and endemic spaces of India.
Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity, Biological Diversity Act, 2002.

Suggested Reading:

1.	Erach Bharucha., Textbook of Environmental Studies, UGC, New Delhi and Bharathi Vidyapeeth Institute of Environment Education and Research, Pune.
2.	**Basu and Xavier Savarimuthu SJ., Fundamentals of Environmental Studies,**Cambridge University Press, New Delhi, 2017**.**
3.	Mishra D D., Fundamental Concepts in Environmental Studies, S Chand & Co Ltd., New Delhi, 2010.
4.	Botkin and Keller., Environmental Science, Wiley India Pvt., Ltd., New Delhi, 2012.
5.	Gilbert, M. Masters., Introduction to Environmental Engineering and Science, Prentice- Hall of India Pvt., Ltd., New Delhi, 1995.
6.	Sasi Kumar, K. and Sanoop Gopi Krishna., Solid waste Management, Prentice-Hall of India Pvt., Ltd., New Delhi, 2009.
7.	Daniel D. Chiras, Environmental Science, Jones & Bartlett Learning Publishers Inc, Burlington, MA, 2014.

MC 802HS	**INTELLECTUAL PROPERTY RIGHTS**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Acquaint the students with basics of intellectual property rights with special reference to Indian Laws and its practices.
2	Compare and contrast the different forms of intellectual property protection in terms of their key differences and similarities.
3	Provide an overview of the statutory, procedural, and case law underlining these processes and their interplay with litigation.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Understand the concept of intellectual property rights.
CO-2	Develop proficiency in trademarks and acquisition of trade mark rights.
CO-3	Understand the skill of acquiring the copy rights, ownership rights and transfer.
CO-4	Able to protect trade secrets, liability for misappropriations of trade secrets.
CO-5	Apply the patents and demonstration of case studies.

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1						
CO-2						
CO-3						
CO-4						
CO-5						

UNIT – I
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer**.**

UNIT – IV
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT –V
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Suggested Reading:

1	Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.
2	“Mayall, “Industrial Design”, McGraw Hill,1992
3	“Niebel, “Product Design”, McGraw Hill,1974.
4	“Asimov, “Introduction to Design”, Prentice Hall,1962.
5	“Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”,2016.
6	T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand,2008

MC 803 HS	ENGLISH FOR TECHNICAL PAPER WRITING					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:	
1.	Understand that how to improve your writing skills and level of readability. Learn about what to write in each section.
2	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

Course Outcomes:	
1.	Able to plan and prepare paragraphs, avoiding ambiguity and grammatical errors
2.	Writing of abstracts, paraphrasing and plagiarism
3.	Providing critical and thorough review of literature, discussions and conclusions
4.	Able to exhibit key skills for writing titles, introduction, abstract.
5.	Able to show key and necessary skills for paper writing, phrases, results.

UNIT-I

Root Words, Synonyms and Antonyms, One word substitutes, importance of Punctuation, Sentence Structure, Subject Verb Agreement, Noun Pronoun Agreement, Redundancy, Cliche

UNIT-II

Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-III

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-IV

Describing, Defining, Classifying, Providing examples or evidence, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check,

UNIT-V

Key skills are needed when writing a Title, Abstract, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions -Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Reading:

1. Norman Lewis, Word Power Made Easy, Anchor Books, New York, Reprint Edition, 2014.

2. C.R. Kothari and Gaurav Garg, Research Methodology: Methods and Techniques, 4th Edition, New Age International Publishers, New Delhi, 2019.

3. P.C. Wren and H. Martin, A Comprehensive Grammar of the English Language, Revised and Updated by N.D.V. Prasada Rao, S. Chand Publishing, New Delhi, Latest Edition.

4. Goldbort R, Writing for Science, Yale University Press (available on Google Books), 2006.

5. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.

6. Highman N Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book. 1998

7. Adrian Wallwork English for Writing Research Papers, Springer New York Dordrecht Heidelberg London. 2011.

MC 804HS	**CONSTITUTION OF INDIA**					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives:

1.	Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective
2.	To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role
3.	Entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

Course Outcomes: At the end of this course, students will be able to**:**

1.	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2.	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3.	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru
4.	The eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5.	Discuss the passage of the Hindu Code Bill of 1956.

Program Articulation Matrix

Course outcome	**Program outcome**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1						
CO2						
CO3						
CO4						
CO5						

Row wise cumulative percentage weightage should be equal to 1.0.

UNIT – I
History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features.
UNIT – II
Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT – III
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions.
UNIT – IV
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayat raj: Introduction, PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
UNIT – V
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

References:

1	"The Constitution of India", 1950 (Bare Act), Government Publication.
2	Dr. S. N. Busi, "Dr. B. R. Ambedkar framing of Indian Constitution", 1st Edition, 2015.
3	M. P. Jain, "Indian Constitution Law", 7th Edn., Lexis Nexis, 2014.
4	D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.

MC 805HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-	-	0
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Cou rse Objectives:

The course aims at enabling the students to

1. Comprehend the Basic fundamental aspects of Society, Culture and Heritage.
2. Understand the significant aspects of Traditional Hindu Social Organization and vedic literature both at individual level and societal level.
3. Inculcate a philosophical insight through shad darshanas and a spiritual outlook through Yoga Sutras.
4. Realize the significance and the utilitarian aspect of the traditional knowledge system through case studies.
5. Appreciate the significance and necessity for the preservation of traditional knowledge system.

Course Outcomes: Student will be able to

1. Know the fundamental concepts of Society with regard to values, norms, cultural and nature of Indian culture.
2. Understand the connect between the vedic literature and the traditional structural organization guiding at the various phases of life of an individual.
3. Recognize the importance of Darshanas and significance of Yoga sutra in building up a holistic life perspective.
4. To inculcate a pursuit of looking deeper into IKS for addressing the multi-faceted contemporary issues both at local and global platform.
5. Analyze the significance and the measures for the preservation of Traditional Knowledge System.

UNIT - I

Fundamental Concepts: Society, Definition and its Characteristics; Values- Norms, Role-Status, Order and Stability, Habits, Custom; Understanding difference between Belief and Ritual, Tradition and Heritage; Culture: Definition and its Characteristics; Characteristics of Indian Culture; Concept of Unity in Diversity;

UNIT - II

Indian Traditional System: Traditional Hindu Organization: Purusharthas, Varna Dharma and Ashrama Dharma. Indian Traditional Scriptures and their Classification; General Understanding of Vedas: Rig veda, Sama veda, Yajur Veda, and Atharva veda, Upanishads; Smritis: Itihasa, Puranas, Agamas, Upvedas, and Vedangas

UNIT - III

Traditional Philosophies / School of thoughts: Darshanas: philosophies of 6 Schools: Nyaya, Vaisheshika, Samkhya, Yoga, Mimamsa and Vedanta; Nastika School of Philosophy Charvaka, Jainism and Bhuddhism; Yoga and Spirituality.

UNIT - IV

Traditional Knowledge System: Definition of Traditional knowledge, Indigenous Knowledge System; Case studies of Ancient traditional Knowledge System Astronomy,Vastu-Shatras, Wootz Steel lost technology of IKS, Water Management, and Agriculture.

UNIT - V

Protection of Traditional Knowledge - Significance and Need of Protection of Traditional Knowledge; and measure for protection of TK, Role of the Government to harness TK. Documentation and Preservation of IKS, Approaches for conservation and Management of nature and bio-resources, Approaches and strategies to protection and conservation of IKS.

Suggested Books for Reference:

1. V. Sivaramnkrishna (Ed.). Cultural Heritage of Lndia-Cou rse Materi al, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2. Swami Jirntmanand. Modern Physics and Vedant, Bharati yaV idya Bhavan
3. Fritzof Capra. Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jba (Eng. Trans.). Tarkasangraha of Annam Bhana, international Chinmay Foundation, Velliamad. Amaku.am
6. Yoga Sutra of Patanjali, Ramakrishna Mission. Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with VyasaBhashya. Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha. Science of Consciousness Psychotherapy and Yoga Practices. Vidya nidhi Prakasham, Delhi. 2016
9. P R Sha.min (English translation). Shodashang Hridayam

MC 806HS	**STRESS MANAGEMENT BY YOGA**					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-		0
Evaluation	**SEE**	60 Marks		**CIE**	40 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Creating awareness about different types of stress and the role of yoga in the management of stress.
2	Promotion of positive health and overall wellbeing (Physical, mental, emotional, social and spiritual).
3	Prevention of stress related health problems by yoga practice.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	To understand yoga and its benefits.
CO-2	Enhance Physical strength and flexibility.
CO-3	Learn to relax and focus.
CO-4	Relieve physical and mental tension through Asanas
CO-5	Improve work performance and efficiency.

Course outcome	**Program Outcome**					
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**
CO-1	-	-	-	-	-	
CO-2	-	-	-	-	-	1
CO-3	-	-	-	1	-	1
CO-4	-	-	-	-	1	1
CO-5	-	-	-	-	1	1

UNIT – I
Meaning and definition of Yoga - Historical perspective of Yoga - Principles of Astanga Yoga by Patanjali.

UNIT – II
Meaning and definition of Stress - Types of stress - Eustress and Distress. Anticipatory Anxiety and Intense Anxiety and depression. Meaning of Management- Stress Management.

UNIT – III
Concept of Stress according to Yoga - Stress assessment methods - Role of Asana, Pranayama and Meditation in the management of stress.

UNIT – IV
Asanas- (5 Asanas in each posture) - Warm up - Standing Asanas - Sitting Asanas - Prone Asanas - Supine asanas - Surya Namaskar.

UNIT – V
Pranayama- Anulom and Vilom Pranayama - Nadishudhi Pranayama – Kapalabhati-Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama.
Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT).

Suggested Reading:

1	"Yogic Asanas for Group Training - Part-I": Janardhan Swami Yogabhyasi Mandal, Nagpur
2	"Rajayoga or Conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
3	Nagendra H.R nad Nagaratna R, "Yoga Perspective in Stress Management", Bangalore, Swami Vivekananda Yoga Prakashan

Web resource:

1	https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2	https://freevideolectures.com/course/3539/indian-philosophy/11

MC 807HS

SPORTS

Instruction per week 3Hours
CIE 50 Marks

Course Objectives:

1. To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
2. To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
3. To develop leadership skills and foster qualities of co-operation, tolerance, consideration, trust and responsibility when faced with group and team problem-solving tasks.
4. To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
5. To prepare each student to be able to participate fully in the competitive, recreational and leisure opportunities offered outside the school environment.

Course Outcomes:

- Students' sports activities are an essential aspect of university education, one of the most efficient means to develop one's character and personal qualities, promote the fair game principles, and form an active life position.
- Over the past year, sports have become much more popular among our students. Let us remember the most memorable events related to sports and physical training.
- Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
- Our teams in the main sports took part in regional and national competitions. Special thanks to our team in track and field athletics, which has been revitalized this year at ICT and which has won Javelin competition.
- Staff of our faculties and students of Sports, Physical Development, & Healthy Lifestyle of Faculty congratulates everyone on the upcoming New Year and wishes you robust health and new victories in whatever you conceive.

I. Requirements:

i) Track Paint (students should bring)
ii) Shoes
iii) Volley Ball, Foot Ball and Badminton (Shuttle)
iv) Ground, Court, indoor stadium and swimming pool

II. Evaluation Process:

Total Marks 50

i) 20 marks for internal exam (continuous evaluation)
  a) 8 marks for viva
  b) 12 marks for sports & fitness
ii) 30 marks for end exam
  a) 10 marks for viva
  b) 20 marks for sports & fitness

* * * * *

Course Code	Course title						Core/PE/OE
PW 891 MN	**PROJECT WORK -II**						**Core**
	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	12	50	100	**6**

Course Objectives:	
1	To enhance practical and professional skills
2	To familiarize tools and techniques of systematic Literature survey and documentation
3	To expose the students to industry practices and team work
4	To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes: After completion of course, the students will be able to	
CO-1	demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to real-world problems
CO-2	evaluate different solutions based on economic and technical feasibility
CO-3	effectively plan a project and confidently perform all aspects of project management
CO-4	Demonstrate effective written and oral communication skills Project work

PREREQUISITES:

1. Able to define Problem with specifications
2. Relevant Literature survey, familiarity with research journals
3. Critically evaluate various available techniques to solve a particular problem
4. Able to Plan the work, prepare required graphs, bar (activity) charts and analyses the results and arrive at a solution
5. Prepare and present results in a scientific manner (Presentation - oral and written)
6. The student will attend special lectures by faculty members, research scholars, post graduate students of the department and invited lectures by engineers from industries and R & D institutions.
7. The objective of these preliminary talks will be to expose the students to real life practical problems and methodology to solve the technical problems.
8. Project schedule will be prepared by the coordinator for all the students from 5th week to the last week of the semester which should be strictly adhered to.

EACH STUDENT WILL BE REQUIRED TO:

1. Submit a one-page synopsis before the seminar for display on notice board.
2. Give a 20 minutes' presentation followed by 10 minutes' discussion.
3. Submit a technical write-up on the Project Work Presentation.
4. At least two teachers will be associated with the Project Work Presentation to evaluate students for the award of sessional marks which will be on the basis of performance in all the 3 items stated above.
5. Submit a Project Report/Project Thesis

GUIDELINES FOR PREPARING B.E./B.TECH. DISSERTATION

The Thesis must be presented on A-4 paper approximately 11 Inches x 9 Inches or 27.9 cm x 22 cm in size and duly hard bound.

1 General

1. The title of the thesis should be concise and clearly convey the work presented.

2. Lists of figures, tables, variables, symbols, acronyms etc. should be included, before the start of the first chapter.

3. The abstract should not be more than 500 words.

4. A declaration stating the originally of work / results should be appended.

5. Any work which amounts to plagiarism should be totally avoided.

6. The entire thesis should be free from grammatical and spelling mistakes.

7. The total number of pages of the thesis should not normally exceed 150.

8. Any downloaded matter of tables or equations, if used, should be rewritten, and the source mentioned.

9. The first Chapter should clearly reflect the importance and objectives of the thesis.

10. A brief literature review may be included in the first or second chapter.

11. The organization of the thesis may be mentioned in the first chapter.

12. The pages should be numbered starting from the first page of the first chapter.

13. The pages before the first chapter should be numbered in small Roman numerals.

14. The headings and sub-headings should be properly numbered chapter wise.

15. Extension work may be indicated in the conclusion.

16. Uniform font and size should be followed for the titles of all chapters.

17. Uniform Indent should be followed throughout the text of the thesis.

18. Similarly uniformly should be maintained for all headings and sub headings.

19. Subscripts and superscripts should be adopted properly.

2 Formatting

1. The text should be presented at one and a half spacing the font name should have Times New Roman, the font sizes are chapter heading 16 points, Sub heading 14 points.

2. The font size of the main text should be uniformly 12 points throughout the thesis.

3. Left justification or left and right justification can be used for main text.

4. The left margin should be 30 -40 mm and the right. Top and bottom margins should be 25 to 30 mm.

3 References

1. The references should be numbered from the first chapter to the last chapter in ascending order and the corresponding number should be shown in square brackets wherever required.

2. The reference should be listed with details after the last chapter.

3. All the references listed should be referred in the main text.

4. The references could be technical papers of Journals, conferences, symposia, workshops and seminars, technical reports, manuals, text books and software.

5. The important contents of referred materials should be in the following order: Name (s) of the author (s), Title of the paper, publication title, year of publication, Vol, No., pp.

4 Appendices

1. Important programs, derivations, data and any other useful material may be shown in the appendices with proper numbering.

2. The appendices should be numbered in capital Roman numbers or capital letters from the first chapter to the last chapter in ascending order. (eg. Appendix 1 or Appendix A)

3. The appendices should be shown with details after the last chapter. 4. All the appendices should be referred in the main text.

5 Equations

1. All the equations used in the thesis should be properly numbered chapter wise (eg. Eq, 3.1)

2. The equations shown should be clearly referred and identified as Eq. or eq. followed by equation number.

3. Repetition of equations should be avoided. If needed, it may be referred by its number.

4. Equations should never be mixed up with main text. It should be shown as separate object and ‘Equation Editor’ can be used.

6 Tables

1. The tables shown in the thesis should be clearly referred and explained and they should be numbered properly.

2. At the top of the table, it should be identified as table, followed by table number (ex. Table 3.1)

3. The caption of the table should be written clearly, precisely and briefly at the same position.

4. A spacing of at least 3 points should be taken for the first line of each cell.

5. Table size should not cross the limits of the set page margins.

6. The font size should be less than or equal to the font size of main text.

7 Figures

1. The figures shown in the thesis should be clearly referred and explained. They should be numbered properly chapter wise.

2. At the bottom of the figure, it should be identified as fig. or figures, followed by figure number (ex. Fig 3.1 or figure 3.1).

3. The caption of the figure should be written clearly, precisely and briefly at the same position.

4. All the graphs and flowcharts should be identified and presented the same way as figures.

5. All the figures and graphs should be drawn clearly, so that variables, units, markings and details are dissembled.

6. All the drawings, text boxes, images and details related to a particular figure should be grouped together.

7. The font size used should be less than or equal to the font size of main text.

8. The figure size should not exceed the set page margins.

Format of B.E./B.Tech. Dissertation

Department of <Name of the Department>
<Name of the College>

Osmania University

CERTIFICATE

This is to certify that the Dissertation work entitled < Title of the Project Work > submitted by < Mr. / Ms. Name of the student (Roll No.) >, a student of Department of < Name of the Department >, < Name of the College > in partial fulfillment of the requirements for the award of the degree of Master of < Engineering / Technology > with < Name of the Specialization> as specialization is a record of the bonafide work carried out by < him / her > during the academic year < Academic year >.

Date &Signature of the Supervisor
< Name >
< Designation >
< Address >

Signature of Head of the Dept.
< Name >
< Designation >
< Address >

Seal

DECLARATION

I declare that the work reported in the Dissertation entitled < Title of M.E. / M. Tech. Thesis > is a record of the work done by me in the Department of < Name of the Department, Place / Organization >.

No part of the thesis is copied from books / journals / internet and wherever referred, the same has been duly acknowledged in the text. The reported data are based on the Dissertation work done entirely by me and not copied from any other source.

Date: Signature of the Student