

**B. TECH. MINING ENGINEERING SYLLABUS 2016 BATCH ONWARDS  
(UPDATED ON 24.05.2019)**

SEMESTER 7 <sup>th</sup>		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCIE3- 738	Underground Mining Methods-Coal	3	0	0	40	60	100	3
BCIE3-739	Industrial Management	3	0	0	40	60	100	3
BCIE3-740	Mining Planning & Design	3	0	0	40	60	100	3
BCIE3-741	Mineral Processing	3	0	0	40	60	100	3
BCIE3-742	Mineral Processing Lab	0	0	2	60	40	100	1
BCIE3-743	Training#	0	0	0	60	40	100	2
<b>Total</b>		<b>12</b>	<b>00</b>	<b>02</b>	<b>280</b>	<b>320</b>	<b>600</b>	<b>15</b>

# In House / Industrial Training of 8 weeks during summer vacation after 6<sup>th</sup> semester.

SEMESTER 8 <sup>th</sup>		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BCIE3- 844	Mine Economics & Investment	3	0	0	40	60	100	3
BCIE3- 845	Underground Mining Methods-Metal	3	0	0	40	60	100	3
<b>Departmental Elective-I (Select any one)</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>60</b>	<b>100</b>	<b>3</b>
BCIE3- 856	Mine Legislation & Safety							
BCIE3- 857	Mine Safety Engineering							
BCIE3- 858	Rock Reinforcement							
BCIE3- 859	Rock Excavation Engineering							
BCIE3- 846	Major Project	0	0	4	60	40	100	2
<b>Total</b>		<b>09</b>	<b>00</b>	<b>04</b>	<b>180</b>	<b>220</b>	<b>400</b>	<b>11</b>

**7<sup>th</sup> Semester**

**MRSPTU**

**UNDERGROUND MINING METHODS - COAL**

**Subject Code: BCIE3-738**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**INTRODUCTION:** Status of coal industry and deposit factors affecting choice of mining methods, classification of mining methods, grading and analysis of coal.

**BORD AND PILLAR METHOD-DEVELOPMENT:** Design and development of a district, bord and pillar, room and pillar methods, with conventional and continuous mining techniques; panel system.

**UNIT II**

**BORD AND PILLAR METHOD – Extraction:** Pillar extraction by caving and stowing methods; mechanized extraction of pillars, shaft pillar extraction, systematic supports, surface, underground and face arrangements for stowing.

**UNIT III**

**LONGWALL METHOD :** Advance and retreat methods, continuous and cyclic systems, extraction with different machines-ploughs, shearers, design of long wall workings, optimum length of face, size of panel, gates, support system, personnel, organization and safety measures, salvaging in long wall.

**UNIT IV**

**SPECIAL METHODS OF WORKING :** Problems of working thick & thin seams, multi slices, sublevel caving, horizon mining, gallery blasting method, contiguous seam working, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. hydraulic mining.

**REFERENCES:**

1. Jain, S.K., Ore Processing, Oxford – IBH Publishing, 1984.
2. Gaudin, A.M., Principles of Mineral Dressing – McGraw Hill Book Company, 1971.
3. Taggart, A.F., Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.
4. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
5. Vijayendra, H.G., Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

**INDUSTRIAL MANAGEMENT**

**Subject Code: BCIE3-739**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**INTRODUCTION:** Technology Management – Definition – Functions – Evolution of Modern Management –Scientific Management – Development of Management thought. Approaches to the study of Management, Forms of Organization – Individual Ownership – Partnership – Joint Stock companies – Co-operative Enterprises – Public sector Undertakings, Corporate Frame Work – Share Holders - Board of Directors – Committees – Chief Executive – Constraints –Environmental – Financial – Legal – Trade Union.

**UNIT II**

**FUNCTIONS OF MANAGEMENT :** Planning – Nature and Purpose – Objectives – Strategies – Policies and Planning Premises – Decision Making – Organizing – Nature and Process – Premises – Departmentalization – Line and Staff – Decentralization – Organizational culture – Selection and training – Placement – Performance appraisal – Controlling – Process of Controlling – Controlling techniques – Preventive control, industrial safety.

**UNIT III**

**ORGANIZATIONAL BEHAVIOUR :** Definition – Organization – Managerial Role and functions – Organizational approaches, individual behavior – Causes – Environmental effect – Behavior and Performance, Perception – Organizational implications. Personality – Contributing factors – Theories of motivation – Job satisfaction – Learning Curves, Work Design and approaches.

**UNIT IV**

**GROUP DYNAMICS:** Group behavior – Groups – Contributing factors – Group norms – Communication – Process– Barriers to communication – Effective communication leadership – Managerial Grid –Leadership Role in Group Decision, Group Conflicts – Types – Causes – Conflict Resolution– Inter group relations and conflict organization – Centralization and decentralization – Formal and informal.

**MODERN CONCEPTS:** Management by objectives (MBO) – Management by Exception (MBE) – Developing strategies, information technology in management – Decision support system – Business Process Reengineering (BPR) – Enterprises Resource Planning (ERP) – Supply Chain Management (SCM).

**REFERENCES**

1. Herald Knottz and Heinz Wehrich. Essentials of Management, McGraw Hill Publishing Company, Singapore International Edition, 1980.
2. Chandran, S. Organizational Behaviour, Vikas Publishing House Pvt. Ltd., 1994.
3. Ties, A.F. Stoner and R. Edward Freeman, Management, Prentice Hall of India Pvt. Ltd.
4. Joseph J. Massie, Essentials of Management, Prentice Hall of India Pvt. Ltd., 1985.

**MINE PLANNING AND DESIGN**

**Subject Code: BCIE3-740**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**INTRODUCTION:** Technical factors in mine planning, methodology of mine planning, short range & long range, mine modeling, mine simulation systems approach to mine planning based on mine subsystem and their elements, mine plan generation.

**OPENCAST 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 90 and optimization, calendar plan, production planning, production scheduling, economic productivity indices.

**UNIT II**

**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, lay out of drainage system, planning production schedule and monitoring, selection of depillaring/stopping method, manpower management economic/productivity indices, techno economic analysis, mine reclamation design.

**UNIT III**

**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 IV**

**PROJECT IMPLEMENTATION AND MONITORING:** Pre-project activities – feasibility report, environment 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.

**REFERENCES**

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 Modelling, Elsevier, 1995.
4. Bawden, W.F., and Archibald., J.F., Innovative Mine Design for the 21st Century Elsevier, 1993.
5. Passamehtoglu, A.G., Karpuz, C., Eskikaya, S. and Hizal, T., (Eds), Mine Planning and Equipment Selection, Elsevier, 1994.
6. Pazdziora, J., Design of Underground Hard Coal Mines, Elsevier, 1988.
7. Swilski, and Richards, Underground Hard Coal Mines, Elsevier, 1986.
8. Singh, B. and Pal Roy, P., Blasting in Underground excavations and mines, CMRS Dhanbad, 1993

## **Mineral Processing**

**Subject Code: BCIE3-741**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

### **Unit I**

**INTRODUCTION:** Scope, objectives, minerals/ores for mineral processing, methods of treatment, choice of methods, sequence of operations, product, flow sheets, ore sorting – hand mechanical, - electronic, removal of harmful materials, ore transportation.

### **Unit II**

**COMMINUTION:** Introduction to comminution, primary/secondary/tertiary crushing, purpose, duty, theory of crushing, crushing sequence, reduction ratio, types of crushers and comparison, general crushing flow sheet, wet/dry grinding, mechanism and various affecting parameters.

### **Unit III**

#### **LABORATORY & INDUSTRIAL SIZING AND SAMPLING AND CONTROL:**

Purpose, factors governing particle behavior, laboratory and industrial screens, trommels, Vibrating screens wet and dry screening, classification, classifiers, Purpose, sampling - solid ore, pulp, head feed, grinding circuit samples, flotation products, etc., X-ray fluorescence, automatic sampling, Metallurgical accounting.

### **Unit IV**

**SEPARATION/CONCENTRATION:** Newton's and Stoke's Laws of particle settlement, different concentration techniques – gravity, chemical froth flotation, wet & dry magnetic separation, electromagnetic, amalgamation, heavy media, jigging, shaking tables, sluicing, spirals, thickeners, filtration, etc., coal washing.

**SPECIAL METHODS:** Chemical extraction, cyanide process, leaching, use of ion exchange, solvent extraction, pilot plant studies on ores, tailing dams; generalized plant practice/flow sheets for coal and other important ores – copper, aluminum, lead, zinc, silver, gold, uranium, iron, limestone, magnesite.

#### **REFERENCES:**

1. Jain, S.K., Ore Processing, Oxford – IBH Publishing, 1984.
2. Gaudin, A.M., Principles of Mineral Dressing – McGraw Hill Book Company, 1971.
3. Taggart, A.F., Handbook of Mineral Dressing, John Wiley and Sons, New York, 1990.
4. Wills, B.A. Mineral Processing Technology, Pergamon Press, 1985.
5. Vijayendra, H.G., Handbook on Mineral Dressing, Vikas Publishing House Pvt. Ltd. 1995.

**Mineral Processing Lab**

**Subject Code: BCIE3-742**

**L T P C**  
**0 0 2 1**

**Duration: 24 Hrs.**

1. Study of grab sampling and different sample division techniques like coning and quartering, riffle sampling techniques, etc.
2. Determination of crushing characteristics of a given mineral sample using jaw crusher.
3. Determination of the grinding characteristics of a given mineral sample using ball mill.
4. Sieve analysis of a given sample and to calculate (a) Percentage sample retained on screens (b) Average size of sample material and (c) To plot sizing curves.
5. Concentration of a given mineral sample using mineral jig.
6. Concentration of a given mineral using Wilfley table.
7. Concentration of a given mineral using froth flotation cell.
8. Concentration of a given mineral using magnetic separator.
9. Study of wash ability characteristic of a coal sample using float and sink test.
10. Study of sedimentation characteristics of a given sample.

**8<sup>th</sup> Semester**

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY



**MINE ECONOMICS AND INVESTMENT**

**Subject Code: BCIE3-844**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**Unit I**

**INTRODUCTION:** Mineral industry and its role in national economy; world and national mineral resources; Mining - A unique investment environment; special risk factors in mine investment and evaluation; 87 national mineral policy.

**Unit II**

**ORE RESERVE ESTIMATION:** Methods of sampling, sampling frequency; analysis of sampling data, estimation of reserves, introduction to geo-statistical methods, and classification of reserves.

**Unit III**

**MINE VALUATION:** Time value of money; annuity; redemption of capital, net present value; depletion allowance; depreciation; inflation; escalation; rates of return; Hoskold's Two rate method; capital and operating cost including wages, incentives, material, etc.; assets; liabilities; cash flows and discounted cash flow; profitability index – their implications in mine economic evaluation.

**Unit IV**

**PROJECT APPRAISAL:** Methods of project evaluation – pay back, annual value, benefit/cost ratio, ERR and IRR, etc., evaluation of exploratory mining areas and operating mines; mine project financing, its risks and constraints; mine taxation; critical impact of depreciation, depletion, type of funding, reserves, life, etc., on mine profitability.

**UNIT V FINANCE AND ACCOUNTING:** Sources of mine funds – shares, debentures, fixed deposit, sinking fund, capital gearing, P & L account, balance sheet, typical case studies of mine feasibility. Cost estimation of individual mining operations and overall mining cost, cost control methods.

**REFERENCES:**

1. Sloan, D.A., Mine Management, Chapman and Hall, London, 1983.
2. Deshmukh, R.T., Mineral and Mine Economics, Mira Publications, Nagpur, 1986.
3. Arogyaswamy, R.N.P. Courses in Mining Geology, Oxford and IBH Publishing Co., 1994.
4. Chatterjee, K.K., Mineral economics, Wiley Eastern, 1992.
5. Park, R.J., Examination and Valuation of mineral property
6. How to read a balance sheet ILO 1992.
7. Indian Mining Year Book 1994 – MMRD Act and Mineral Concession Rules.

**UNDERGROUND MINING METHODS - METAL**

**Subject Code: BCIE3-845**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**BASICS :** Metal Mining Terminology; Typical modern metal mine features; typical pre stopping ore block constructional features; classification of methods; Techno economic characteristics impacting on choice of method; Typical unit cost parameters; optimum size of mine and stope.

**UNIT II**

**GENERAL MINE DESIGN :** Mode of mine and stope entry; Layouts; optimum production; Basic design – Level Intervals, ore pass, common ore pass, size of blocks ore handling in stope and other openings, overview of constructional features – X cuts, Raises, Winzes etc.

**UNIT III**

**STOPPING – GENERAL DESCRIPTION:** Unsupported methods – Room and pillar, shrinkage, sublevel stopping etc. Supported stopes– Cut and fill, square set etc. Caving methods – Top slicing, sublevel caving, block caving.

**STOPE PLANNING AND LAYOUT:** Preparing a stopping block; sequence of stopping; organization; production cycle; unit cost calculation.

**UNIT IV**

**NOVEL INNOVATIVE TECHNIQUES & SPECIAL APPLICATIONS:** Rapid excavation; Hydraulic mining; slurry mining; solution mining; Radial – axial splitter; Thermal fragmentation; shock wave breaking; Nuclear mining. Deep mining; narrow contiguous veins; shaft and remnant pillars; VCR; Ring drilling; Large Blast hole stopping. Case studies of Indian and foreign underground metal mines.

**REFERENCES:**

1. Cummings, A.B. and Given, I, V., SME Mining Engg. Handbook Vol. I And II, Society Of Mining Engineers Of American Institute Of Mining, Metallurgical, Petroleum Engineers Inc., New York 1992.
2. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
3. Hustrulid, W.A. Ed., Underground Mining Methods Handbook Society of Mining Engineering, AMIE, New York, 1990.

**MINE LEGISLATION AND SAFETY**

**Subject Code: BCIE3-856**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**INTRODUCTION TO MINING LAWS AND LEGISLATION:** General principles of mining laws, development of mining legislation of India.

**UNIT II**

**ACTS, RULES AND REGULATIONS – I :** Mines Act, Mines Rules, Coal and metalliferous mines Regulations, Bye-laws, Circulars, and standing orders (Except the ones which are collected in course Drilling & Blasting, Surface Mining, Mining Machinery I & II, Mine Environmental Engineering I, II & III, Underground Mining methods (Coal & Metal)

**UNIT III**

**ACTS RULES AND REGULATIONS – II :** Indian electricity rules, coalmines conservation and development act, Workman's compensation act., General provisions of Mines and Minerals Regulation and Development Act, Mineral Concession Rules, Vocational Training .Rules, Crèche rules, Maternity benefit act, Payment of Wages Act, Gratuity and P.F. Rules, Explosives act, Rescue Rules, Factory Act, Environmental Protection Act.

**UNIT IV**

**ACCIDENTS AND DISEASES: Classification** of accidents, causes and prevention of accidents, accident enquiry reports, cost of accidents, occupational diseases and their social effects.  
**MINE SAFETY:** Role of management, Labour and government, Safety audit, Instrumentation, organization for disaster management in mines, safety conferences.

**REFERENCES**

1. Mines Act 1952, Lovely Prakashan, Dhanbad, 1995.
2. Coal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.
3. Metal Mines Regulations, 1961, Lovely Prakashan, Dhanbad, 1995.
4. DGMS Circulars, By National Council of Safety in Mines, Dhanbad, 1995.
5. Mines rules, 1955, Lovely Prakashan, Dhanbad, 1995.
6. The Mines Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1995.
7. The Indian Electricity Rules, 1995, Lovely Prakashan, Dhanbad, 1995.
8. The Payment of Wages Act, 1936, Ram Narain Lal Beni Prasad, 1995.
9. Vocational Training Rules, Lovely Prakashan, Dhanbad, 1995.

**MINE SAFETY ENGINEERING**

**Subject Code: BCIE3-857**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**MINE ACCIDENTS:** Accident in mines- different types, accident investigations; accident analysis; accident prevention and corrective action, accident proneness, creating and maintaining safety awareness, ZAP and MAP, job safety analysis, safety meeting and committee.

**UNIT II**

**HEALTH AND MINE SAFETY:** Definition of health and safety, management's role – function; evolution of management involvement, management's training, responsibility, cost of health and safety, role of labour organizations – Union impact and involvement, role of government – statutory controls and directions, spot and regular inspections, enforcement of standards, penalties for violations, collection and distribution of statistical data.

**UNIT III**

**FAULT TREE ANALYSIS:** Introduction – methodology, symbols and Boolean techniques, qualitative analysis, computerized methods, statistical analysis, safety information, systems design.

**MINER'S OCCUPATIONAL DISEASES AND ENQUIRY COMMITTEE:** Miner's occupational health and diseases, preventive medical examinations, various types of injuries, compensable diseases, medical attention and removable of causative factors in the mines.

**UNIT IV**

**RISK ASSESSEMENT AND DISASTER MANAGEMENT: Principles,** risk and hazard control, risk and hazard evaluation and data collection for identified health risks, exposure assessment and risk characterization, probabilistic risk analysis, risk management, safety culture, human factors, reliability evaluation, safety audit. Identification of causes of mine disasters, preventive action, disaster management and mitigation, typical cases of mine disasters in India

**REFERENCES**

1. Brown, D.B., System Analysis and Design for Safety, Prentice Hall, 1976.
2. Stranks, J., Management Systems for Safety, Pitman Publishing, 1994.
3. DeReamer, R., Modern Safety Practices, John Wiley and Sons.
4. Wahab Khair. A., New Technology in Health and Safety, SMME, 1992.
5. Zyl, D.A., Koval, M, Li Ta, M. (Ed.). Risk Assessment / Management Issues in the Environmental Planning in Mines, SMME, 1992.
6. Prasad, S.D. and Rakesh., A Critical Appraisal of Mine Legislations. Lovely Prakashan, 1995. Dhanbad.
7. Mine Disasters of India, NCSM Publication.
8. Kejriwal, B.K., Safety in Mines, Gyan Khan Prakashan, Dhanbad, 1994.

**ROCK REINFORCEMENT**

**Subject Code: BCIE3-858**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**ROCKMASS CLASSIFICATION:** Basic concepts of rock mass classification; Rock Quality Designation (RQD) ; Norwegian Geo-mechanics Classification i.e. Q-system; Rock Mass Rating (RMR); CMRI system; Application of rock mass classification in assessing the support requirement for underground caverns.

**UNIT II**

**GROUTING, GUNITING AND SHOTCRETING :** Mechanisms of rock reinforcement by grouting; selection of optimum pressure and water cement ratio for grouting; layout for grouting, working principle and field of application for grouting; Guniting and shotcreting operations and their field of application; fibre reinforced shotcreting.

**UNIT III**

**ROCK BOLTS :**Elements of rock bolts; types of rock bolts and their fields of application; rock bolting machines and installation of rock bolts; pre-tensioning of rock bolts; principles of rock bolting; anchorage test and factors affecting anchorage strength of bolts; modes of failure; Design of rock bolting system for underground excavation i.e. determination of bolt length and bolt pattern.

**UNIT IV**

**CABLE BOLTS AND ROCK ANCHORS :** Classification of cable bolts; installation and testing; modes of failure; different type of grouting materials; types of anchors; use of anchors for stabilizing rock slope, dam etc. ; testing of anchors.

**SPECIAL METHODS OF ROCK REINFORCEMENT :** Ground freezing for slope stabilization; berms for slope stabilization; fore-poling; resin grouted rock bolts of fibre glass; geo-textiles and it's area of application; water drainage and rock reinforcement; dump stabilization by vegetation.

**REFERENCES**

1. Schach, R., Garshael, K. and Heltzen, A. M., Rock Bolting – A Practical Handbook, Pergamon Press, 1979.
2. Peng, S.S. Ground Control, Wiley Interscience, New York, 1987

**ROCK EXCAVATION ENGINEERING**

**Subject Code: BCIE3-859**

**L T P C**  
**3 0 0 3**

**Duration: 36 Hrs.**

**UNIT I**

**INTRODUCTION:** Concepts, historical developments in rock excavation, systems, factors affecting the rock fragmentation, mechanism of rock breakage and fracture; their application to rock fragmentation methods for rock fragmentation – explosive action, cutting, ripping and impacts.

**UNIT II**

**ROCK MECHANICS:** Rock properties related to machining process; application of compressive, tensile and multi-axial strengths, index tests and abrasivity, anisotropy, elasticity, porosity, laminations, bedding and jointing in rock fragmentation process.

**UNIT III**

**ROCK CUTTING TECHNOLOGY:** Mechanism of drilling – rotary, percussive, rotary, rotary percussive, mechanics of rock machining, theory of single tool rock cutting, crack initiation and propagation, breakage pattern, rock excavation by cutting action – picks, discs, roller cutters water jet cutting, methods of evaluation of drillability and cuttability of rocks.

**UNIT IV**

**ROCK CUTTING TOOLS:** Rock cutting tool materials, different types, relative applications and their choice, tool shape and size, specific energy consumption, tool wear, effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

**ROCK EXCAVATING MACHINES:** Excavating machines, principles, operation, applicability and technical indices of road headers, TBM'S coalface machines and bucket wheel excavators.

**REFERENCES**

1. Cummings, A.B. and Given, I.V., SME Mining Engg. Vol. I and II, Society of Mining Engineers, America, 1992.
2. Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.
3. Chugh, C.P., Diamond Drilling, Oxford-IBH, 1984.
4. Clark, G.B., Principles of Rock Fragmentation, John Wiley and Sons, New York, 1987.

**MAJOR PROJECT**

**Subject Code: BCIE3-846**

**L T P C**  
**0 0 4 2**

To provide the students an opportunity to express their skills, academic knowledge, practical experience and ability to analyze problems and suggest solution.

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.