VII SEMESTER

MINE PLANNING AND DESIGN

Sub Code	**: 10MN 71**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Government Role and Influence in Mining: Social-Legal-Political – Economic impacts, mining law, Health and safety standards. Environmental consequences.

07 Hrs

Mine Development: Land Acquisition, Plant silting and construction, environmental Protection and Permission, impoundments and dams.

07 Hrs

Planning of Coal Mines: Principles of mine planning, stages of planning of new mines, selection of mine sites, geological aspects, division of a coal field into mining areas.
06Hrs

Surface layouts, pit bottom layout, transport system. Application of computer to mine planning.

06 Hrs

Part-B

Opening Up Coal Deposits: Mining Area, Term of life and mine capacity, division of mining property into parts, length, number and position of productive Longwall faces, dimensions of development workings, costs of various mining operations.
07 Hrs

Opening up with- Adits, Inclines. Opening up with vertical shafts, open up with shafts and cross measure drifts. Choice of method of opening up by various methods.

07 Hrs

Mine Exploitation: Mining methods, classification systems, computer methods, mine closure, sealing and abandonment.

06 Hrs

Novel and Innovative Mining Methods. Evaluation of Mining Methods and Systems**.** **06 Hrs**

TEXT BOOKS:

Advanced Coal Mining – B.M. Vorobjev & R.T.Deshmukh, Asia Publishing House, Bombay 1966.
Introductory Mining Engineering – Hartman, John Wiley and Sons Inc. 1987.

REFERENCE BOOKS:

S.M.E. Mining Engineering Handbook, Vol. I & II. Hartman, Society for Mining metallurgy and Exploration Inc. 1992. (Sections 3, 6, 7,8, 22 and 23).
Underground Winning of Coal – T.N. Singh, Oxford IBH, 1992.
Modern Coal Mining Technology – S.K.Das, Lovely Prakashan, Dhanbad, 1996.
Principles & Practices of Modern Coal Mining – R.D. Singh, New Age International (P) Ltd. Publishers, 1997, Section 16.
Mine Planning for Coal S.P.Mathur, MG Consultants Bilaspur, 1993.
Mining B. Boky Mir Publishers, 1967.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

GROUND CONTROL

Sub Code	**: 10MN 72**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

PART-A

Introduction: Definition, types of underground excavation, excavation design and constraints. Influence of water, time and temperature on stress behavior. Theories of rock failure: Griffith's, Columb Navier, Mohr's, Hoek & Brown.

06 Hrs

Subsidence: Theories, factors affecting subsidence, prediction, monitoring and determination. Subsidence damage and preventive measures.

06 Hrs

Stability of Rock Excavations: Re-inforcement of mine fills, autoconsolidated rock fill, cemented sand fill and rock fill, chemical activators in fill cementation.

06 Hrs

Analysis of Stress around Underground Excavation: Introduction, Premining and Induced Stresses, stress distribution around single excavation, circular, multiple, pillar and irregular shapes. Analytical approaches: Introduction, numerical models, finite element method (FEM), BEM, DEC, Photoelasticity.

08 Hrs

PART-B

Classification of Rock Masses: Introduction, methods and approaches: Terzaghi, RQD, RSR, RMR, Q, NATM, ISRM, Limitations.

07 Hrs

Types of Supports and their Design: Conventional and Powered supports, Rock Bolting, Roof Trusses, Shotcreting, Fibre supports, Support layouts, estimation of support resistance, Rock Structure interaction, Timber, steel, concrete and cable bolt supports and design aspects.

07 Hrs

Instrumentation and Monitoring: Types of stress strain measuring instruments: loadcells, strain gauges, convergence measurement instruments, dilatometers, extensometers, optical gauges, compressometers, methods of monitoring and their limitations.

06 Hrs

Miscellaneous: Rock burst and coal bumps: Mechanism, causes, occurrence, estimation of damage, prediction and preventive measures. Cavability, goaf control. Design of single and multiple openings.

06 Hrs

TEXT BOOKS:

Rock Mechanics and the Design of Structures in Rocks, L.Obert and W.I.Duvall, John Wiley and Sons, 1966.

Coal Mine Ground Control, S.Peng, John Wiley and Sons, Inc. 1978.

REFERENCE BOOKS:

S.M.E. Mining Engineering Hand Book, Volume I and II, Society for Mining, Metallurgy & Exploration. Inc. 1992.

Underground Mining Methods Hand Book, W.A. Hustralid, Society for Mining, Metallurgy & Exploration Inc. 1982.

Ground Mechanics in Hard Rock Mining, M.L.Jeremic, Oxford & IBH Publishing Co. New Delhi, 1986.

Design of Supports in Mines, C.Biron & E. Arioglu, John Wiley & Sons, New York, 1983.

Underground Mining Methods and Technology, Proceedings of the International Symposium, Nottingham, Elsevier 1986.
Coal Mining Technology Theory and Practice Robert Stefanko SME 1983.
Underground Excavations in rock E. Hoek and E.T. Brown IMM, 1980.
Support of Underground Excavation in Hard Rock E. Hoek et. al., Oxford and IBH 1995.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

COMPUTER APPLICATION IN MINING

Sub Code	**: 10MN73**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Computer Aided Design: Fundamentals of CAD, Introduction, The Design Process, The application of Computers for Design, Creating the Manufacturing Data Base, Benefits of Computer – Aided Design.
06 Hrs

Hardware in Computer – Aided Design: Introduction, The design Workstation, the Graphics Terminal, Operator Input Devices, Plotters and Other Output Devices, The Central Processing Unit, Secondary Storage.
07 Hrs

Computer Graphics software and Database: Introduction, The Software Configuration of a Graphics System, Functions of a Graphics Package, Constructing the Geometry, Transformations, Data base Structure and Content, Wire-frame Versus Solid Modeling, Other CAD Features, Application of Computers in Mining Industries.
07 Hrs

Algorithms-1: Development of algorithms in Ore Reserve Estimation, Equipment Selection, Material Handling System, Pit Configuration, SARPAC **06 Hrs**

Part-B

Algorithms-II: Blast Design, Pillar Design, Subsidence Protection, Ventilation Network Analysis, Ground Vibration Prediction from Blasting.

06 Hrs

Data Base Management System: Introduction: Database Approach versus traditional file processing Approach, DBMS Administrators, Designers users, Developers, and maintenance, uses of DBMS, Datamine Package.

Database System Concepts and Architecture: Architecture, Data Models,

Schemes and Instances, Architecture and Data Independences, Database languages

and Interfaces, Classification of Management Systems. Entity-Relationship Model:

Entitites, Attributes, Key Attributes, relationships, Roles. Structural Constants,

Weak Entity Types, E-R Diagram.

07 Hrs

Relational Data Models and Relational Algebra: Relational Models concept, the relational Algebra, Additional Relational Operators, Queries in the Relational Algebra.

06 Hrs

SQL - A Relational Database Language: Data Definition in SQL, Views in SQL, Queries in SQL. Queries. Database Design: Normal forms based of primary keys, First, Second, Third normal forms, BCNF.

07 Hrs

TEXT BOOKS:

Fundamentals of Database Systems, Elmarsi and Navathe, 3rd edition, Wesley 2000.

CAD/CAM : Computer Aided Design and Manufacturing, Mikell P. Groover, Emory W. Zimmers, Jr. PHI Inida, 1989.

REFERENCE BOOKS:

Mine Ventilation and Air – Conditioning, Hartman, Wiley International, 1961.

Mine Environmental Engineering, V.S. Vutukuri & Lama, Cambridge University Press, 1986.

Database System Concepts, Korth, Mc Graw Hill, 1986.

CAD/CAM Theory and Practice by Zeid, Tat Mc. Graw Hill.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINE LEGISLATION

Sub Code	**: 10MN 74**	**A Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Introduction: Brief historical perspective legislation in Indian Mines. **08 Hrs**

Mines Act: Preliminary, Inspectors and Certifying surgeons, committee, mining operations and management of mines. Provisions to health and safety. **06Hrs**

Mines Act :Hours and limitations of employment, Leave with wages, Regulations and bylaws, penalties and procedures.
06Hrs

Mines Rules: Preliminary, committee, court of enquiry, certifying surgeons, Medical Examination of persons employed. Workmen's inspector and safety committee, health and sanitation provision, first aid and medical appliance. Employment of persons, leave with wages and overtime. Welfare amenities, registers and notices.

06 Hrs

Part-B

Metaliferrous mines regulation: Preliminary returns, notices and records, inspectors and mine officials, duties and responsibilities of work men, plans and sections, means of access, ladders and ladder ways, transport of men and materials, winding in shafts, transport of men and material haulage, mine workings, precaution against dangers from fire, dust gas and water, ventilation, lighting and safety lamps, Explosives and shot firing, machinery, plants and equipments.

07 Hrs

Coal mines regulations: Preliminary returns, notices and records, inspectors and mine officials, duties and responsibilities of work men, plans and sections, means of access, ladders and ladder ways, transport of men and materials,

winding in shafts, transport of men and material haulage, mine workings, precaution against dangers from fire, dust gas and water, ventilation, lighting and safety lamps, Explosives and shot firing, machinery, plants and equipments.

07 Hrs

Crèche Rule: Provision of crèches, standards of crèches, medical arrangement of crèches.

08 Hrs

Maternity Benefit Act in Detail.

05Hrs

TEXT BOOKS:

Mines Act 1952, Mines Rules 1955, Universal Law Publishing, Pvt. Ltd., 1999.
Metalliferous Mines Regulations 1961, Universal Law Publishing Pvt. Ltd., 1999.

REFERENCE BOOKS:

Legislation in Indian Mines – A critical Appraisal Prasad and Rakesh, 5th edition Tara Printing Works, varanasi, 1990.
Maternity Benefit Act, & Mines Crèche Rules, Universal Law Publishing Pvt. Ltd., 1999.
Encyclopedia of Mining Law – D.D. Seth. Law Publishers (India) Pvt. Ltd., Allahabad, 1999.
Mine Management Legislation and General Safety, S. Ghatak, Coal Field Publishers, Asansol, 1999.
Coal Mines Regulation 1957, Universal Law Publishing Pvt. Ltd., 1999.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

ADVANCED SURFACE MINING

Sub Code	**: 10MN751**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

PART-A

Planning: Land Acquisition, detailed prospecting and delineation of ore bodies, Concept of Cut off grade for the estimation of ore reserves, quality control and conservation, out put and man power planning.

08 Hrs

Pit Layout: Preparation of the site, selection of site for initial box cut, numbers, length, width, height and direction of benches.

06 Hrs

Layouts Design: Pit layout plotting for different equipment's combination, calendar planning.

06 Hrs

Introduction to Slope Failure: Factors affecting the stability of a slope, different types of slope failure-plane, wedge, circular failure and Toppling.

06 Hrs

PART-B

Analysis of Slope Stability: Factor of safety calculation for plane failure and wedge failure, analysis of circular failure using circular failure charts.

06 Hrs

Choice, Type and Degree of Mechanization: Selection of Continuous and Discontinuous Opencast Mining machineries, Selection of drills, selection of size and population of shovel, dumper, dragline, bucket wheel excavators basing on the amount of material to be handled, out put data and cycle time, continuous surface miner and its applicability.

08 Hrs

Safety Aspects: Safety Aspects in Opencast Mines Regarding height, width and slope of the benches, fly rocks, mine illumination, Ground Vibrations due to Blasting.

06 Hrs

Design of Haul road and Spoil Dump: Design Aspects of haul roads, selection of site for spoil dumps, design aspects for spoil Dumps, Stability of Spoil dumps.

06 Hrs

TEXT BOOKS:

Surface Mining Technology, S.K.Das, Lovely Prakashan, Dhanbad, 1994.
Surface Mining by G.B. Mishra, Dhanbad Publishers, Dhanbad, 1978.

REFERENCE BOOKS:

S.M.E. Mining Engineering hand Book Vol. I and II, Hartman, Society for Mining, Metallurgy and Exploration Inc. 1992.
Elements of Mining Technology, Vol. I, II and III - D.J. Deshmukh, Central Techno Publication, 1998.
Method of Mining, Working Coal and Metal Mines, Vol. I, II and III – Wood ruff S.D., Pergoman Press, 1968.
Proceedings of International Symposium on Thick Seam Mining, Indian School of Mines, Dhanbad, MMGI, 1965.
Coal Mining Vol. I, II, III and IV – Statham I.C.F., The Coxton Publication Company, 1960.
Introductory Mining Engineering – Hartman H.L. John Wiley and Sons Inc. 1987.
Advanced Coal Mining Vol. I, II – Vorobjev B.M. and Deshmukh R.T., Asia Publishing House, Bombay, 1966.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

PROJECT MANAGEMENT

Sub Code	**: 10MN752**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Concepts of Project Management: Concepts of a Project, Categories of projects, Phases of project life cycle, Roles and responsibilities of project leader, tools and techniques for project management.

06 Hrs

Project Planning and Estimating: Feasibility report, phased planning, Project planning steps, Objectives and goals of the project, preparation of cost estimation, evaluation of the project profitability.

06 Hrs

Organizing and Staffing the Project Team: Skills/ abilities required for project manager, Authorities and responsibilities of project manager. Project organization and types accountability in project execution, controls, tendering and selection of contractors.

08 Hrs

Project Scheduling: Project implementation scheduling, effective time management, different scheduling techniques, resources allocation methods.

06 Hrs

Part-B

Tools and Techniques of Project Management: Bat (GAMTT) chart, bar chart for combined activities, logic diagrams and networks, Project evaluation and review Techniques (PERT) Planning, Computerized project management.

08 Hrs

Co-ordination and Control: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance control, schedule control, cost control.

06 Hrs

Performance Measures in Project Management: Performance indicators, performance improvement for the CM & DM companies for better project management, Project management and environment.

06 Hrs

Case Studies on Project Management: Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.

06 Hrs

TEXT BOOKS:

Project Management a System Approach to Planning Scheduling & Controlling, Harold Kerzner, CBS Publishers and Distributors.

Chaudhry S., Project Execution Plan: Plan for Project Execution Interaction.

REFERENCE BOOKS:

Project Management – Beningston Lawrence – Mc. Graw Hill – 1970.

A Management Guide to PERT and CPM, WEIST & LEVY, Eastern Economy of PHI.

PERT & CPM – L.S. Srinath, Affiliated East West Press Pvt. Ltd.

Project Management with PERT and CPM, Moder Josph and Phillips cerel r., 2nd edition, New York VAN Nostrand, Reinhold – 1976.

Project Planning analysis Selection Implementation & Review – prasanna Chandra, ISBNO-07-462049-5.
Angus, Planning, Performing and Controlling Projects, 3rd End, Pearson Education Pvt. Ltd., ISBN: 812970020.
Project Planning, Scheduling & Control, James P. Lewis, Meo Publishing Company.
Bhavesh M. Patel, Project Management, Vikas Publishing House, ISBN 81-259-0777-7
Jack Gido, James P. Clements, Successful Project Management, Vikas Publishing House, ISBN 981-243-137-3

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

SOFTWARE ENGINEERING

Sub Code : 10MN753 **IA Marks : 25**
Hrs/ Week : 04 **Exam Hours : 03**
Total Hrs. : 52 **Exam Marks : 100**

Part-A

Introduction: Software and software engineering, phases in software engineering, process model, waterfall model, prototyping etc.

06 Hrs

Software Requirement Specifications: Role of SRS data flow diagrams – problems, data dictionary, structured analysis, prototyping, other CASE tools. Pseudo codes, HIPO diagrams, software tools of developments facilities.

07 Hrs

Planning a software Project: Cost estimation, methods, single variable models, COCOMO models-problems.

06Hrs

Project scheduling staffing and personnel planning software configuration management team structure. Quality assurance plans. Project monitoring and risk management.

07 Hrs

Part-B

System Design: Module level concepts – coupling and cohesion design methodology – problem object oriented approach design specifications.

07 Hrs

Detailed Design and Coding: Module specifications, data abstractions – problem. Detailed design using process design language (PDL) – problems verification, complexity matrices – problems.

07 Hrs

Programming Practices: Programming practices in coding top down & bottom up methods. Structured programming information hiding, programming style, verification – problems defensive programming.

07 Hrs

Testing: Testing fundamentals, functional and structural testing, testing process that plan, test case specifications, metrics – problems top down Vs bottom up testing, debugging techniques, compiler diagram.

05 Hrs

TEXT BOOKS:

An Integrated Approach to Software Engineering, 2nd Edition, Pankaj Jalote, Norosa Publishing House, 1997.
Software Engineering, Rogers S. Pressman, Mc. Graw Hill, 1997.

REFERENCE BOOKS:

Software Engineering, Martin, L. Shooman, Mc. Graw Hill, 1993.
Software Engineering Concepts, Richard. E. Fairley, Mc. Graw Hill, 1985.
Software Engineering, Environment Concepts & Technology, Robert N. Charette, Mc Graw Hill, 1988.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

OPERATIONS RESEARCH

Sub Code	**: 10 MN 761**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

1. **Introduction:** OR methodology, Definition of OR, Application of OR to engineering and Managerial problems, Features and Limitations of OR. **04 Hrs**

2. **Linear Programming:** Definition, mathematical formulation, standard form, solution space, solution-feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy, Graphical and Simplex methods. **08Hrs**

3. **Variants of Simplex algorithm** – Artificial basis techniques. Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simples method.
06 Hrs

4. **Transportation Problem:** Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. **Assignment Problem**: Formulation, unbalanced assignment problem, Traveling salesman problem.
08 Hrs

Part-B

5. **Queuing Theory:** Queuing system and their characteristics. The M/M/I Queuing system, Steady state performance analyzing of M/M/I and M/M/C queuing model.
06 Hrs

6. **Project Management Using Network Analysis:** Network construction, determination of critical path and duration, floats. PERT – Estimation of project duration, variance. **07Hrs**

7. **CPM** – Elements of crashing, least cost project scheduling. Flow in networks: Determination of shortest route, Determination of Maximum flow

through the networks.

07 Hrs

8. **Game Theory:** Formulation of games, Two Person - Zero sum game, games with and without saddle point, Graphical solution (2Xn, mX2 game), dominance property.

06 Hrs

TEXT BOOKS:

1. Taha H.A. – Operations Research and Introduction, Mc. Millan. ISBN -0-02-418940-5.
2. Philips, Ravindran and Soleberg – Principles of Operations Research – Theory and Practice, PHI.

REFERENCE BOOKS:

1. Hiller and Liberman, Introduction to Operation Research, Mc. Graw Hill Vth Edition.
2. S.D. Sharma – Operations Research, Kedarnath, Ramnath & Co.
3. J.K.Sharma, Operations Research Theory and Application, 2nd Edn, ISBN – 0333-92394-4.
4. Kanthi Swarup & Others – Operations Research, Sultanch and Sons.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

OPERATIONS MANAGEMENT

Sub Code	**: 10MN 762**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Operations Management Concepts: Introduction, Historical Development, the Trend: Information and Non-Manufacturing Systems, Operations Management, Factors affecting Productivity, International Dimensions of Productivity, The Environment of Operations, Production Systems Decisions – a look ahead.

07 Hrs

Operations Decision Making: Introduction, Management as a Science, characteristics of decisions, Framework for decision making, Decision methodology, Decision supports systems, Economic models, Statistical models.

06 Hrs

Systems Design and Capacity: Introduction, Manufacturing and Service Systems, Design and Systems Capacity, Capacity Planning. **06 Hrs**

Forecasting: Forecasting Objectives and Uses, Forecasting Variables, Opinion and Judgemental methods, Time Series methods, Exponential smoothing, Regression and Correlation methods, Application and Control of Forecasts.

07Hrs

Part-B

Aggregate Planning and Master Scheduling: Introduction, Planning and Scheduling, Objectives of Aggregate Planning, Aggregate Planning Methods, Master Scheduling Objectives, Master Scheduling Methods.

07 Hrs

Material and Capacity Requirements Planning: Overview: MRP and CRP, MRP: Underlying Concepts, System Parameters, MRP logic, System refinements, Capacity Management, CRP activities.

07 Hrs

Scheduling and Controlling Production Activities: Introduction, PAC objectives and data requirements, Scheduling strategy and guidelines, Scheduling Methodology, Priority Control, Capacity Control.

Single Machine Scheduling: Concept, Measures of Performance, SPT Rule, Weighted SPT Rule, EDD Rule, Minimizing the number of tardy jobs. **06 Hrs**

Flow Shop Scheduling: Introduction, Johnson's Rule for 'n' jobs on 2 and 3 machines, CDS Heuristic.

Job Shop Scheduling: Types of schedules, Heuristic Procedure, Scheduling 2 jobs on 'm' machines.

06 Hrs

TEXT BOOKS:

Monks, J.G., Operations Management, McGraw Hill International Editions, 1987.
Pannerselvam R., Production and Operations Management, PHI, 2002.
Productions & Operations Management by Adam & Ebert.2002.

REFERENCE BOOKS:

Buffa, Modern Production / Operations Management, Wiely Eastern Ltd. 2001.
Chary, S.N., Production and Operations Management, Tata McGraw Hill, 2002.
Operations Management by James Dilworth, 2000.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MAINTENANCE MANAGEMENT IN MINES

Sub Code	**: 10MN763**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Maintenance of Mining Machinery: Objectives and types, corrective, plant, preventive and predictive maintenance: Reliability centered maintenance: upkeep of maintenance record.
06 Hrs

Elements of down time of machinery. Possible cause for machine delay and production stoppage. Data selection regarding machine delay and their analysis.

06 Hrs

Maintenance Facilities in Mines for Minor and Major Repairs: Maintenance planning and scheduling; long and short-term maintenance plans, determining the optimal maintenance policy.

07 Hrs

Maintenance Scheduling: Maintenance scheduling by the application of network technique. Application of queuing theory in maintenance of mining equipment.

07 Hrs

Part-B

Definitions of Reliability, Availability and Maintainability: Possible measures to increase the availability of mining machinery. Maintenance budgeting: estimation of cost of resources required to meet the excepted maintenance load.

07 Hrs

Maintenance management System: Computerized documentation of plant and equipment management.

07 Hrs

Advanced Maintenance Procedures and Techniques: Online diagnostic maintenance, tribology techniques vibration and temperature monitoring of machinery. **06 Hrs**

Illustrative examples of maintenance of an operating underground mine and open cast mine.
06 Hrs

TEXT BOOKS:

Maintenance Planning and control, Anthony Kelley, Affiliated East West Press, New Delhi 1981.

Reliability Engineering, Govil A.K., Tata Mc. Graw Hill Company, New Delhi, 1983.

REFERENCE BOOKS:

Special Issues of Journals of Mines, Metals and Fuels on Mine Mechanization, Vol. 59, 1992.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

ROCK MECHANICS LABORATORY

Sub Code	**: 10MNL 77**		**IA Marks**	**:**	**25**
Hrs/ Week	**: 03**		**Exam Hours**	**:**	**03**
Total Hrs.	**: 42**		**Exam Marks**	**:**	**50**

Part-A

Preparation of rock specimens for laboratory tests.
Determination of uniaxial compressive strength of rocks.
Determination of compressive strength index of rocks by using point load tester.
Determination of tensile strength of rock by Brazilian test.
Determination of Protodyakanov index of the given rock specimen.
Determination of slake durability index of rocks.

Part-B

Determination of shear strength.
Determination of punch shear strength.
Tri-axial testing of samples.
Schmidt hammer test.
Plotting of Stereographic Hemispherical projections of Discontinuities.

Determination of Rock Quality Designation of rock.

Scheme of Examination: Students should be asked to conduct two experiments in the examination.

Experiment 1	20 Marks
Experiment 2	20 Marks
Viva Voice	10 Marks
Total	50 Marks

COMPUTER APPLICATION IN MINING LABORATORY

Sub Code	**: 10MNL78**		**IA Marks**	**:**	**25**
Hrs/ Week	**: 03**		**Exam Hours**	**:**	**03**
Total Hrs.	**: 42**		**Exam Marks**	**:**	**50**

Part-A

Learning of the following commands using a CAD package.

Drawing Commands: Line, arc, circle, polygon, Donut, Solid, Spline Pline, Text, M Line, ellipse, dimensioning, object snaps point, Hatch, layers, Units.

Editing Commands: Limits, Erase, Array, Copy, Move, Offset, Stretch, Pedit, change properties, Trim, Extend, Fillet, Chamfer, Break, Mirror, Scale, Rotate, Zoom, Pan.

Enquiry Commands: Id, list, Dist, Area, DB list, Status

Selection sets i.e. window, crossing, fence, W polygon.

Plotting.

Part-B

8 exercises (mining drawing) using any of the above commands.

Scheme of Examination: Students should be asked to conduct two experiments in the examination.

Experiment 1	20 Marks
Experiment 2	20 Marks
Viva Voice	10 Marks
Total	50 Marks

VIII SEMESTER
GENERAL SAFETY

Sub Code	**: 10MN81**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Introduction: Safety conference and their impact, Safety Education and training Pit Safety committee, Management Safety Audit system. **06 Hrs**

Internal Safety Organization, Safety Policy, health and safety program, Feed back of safety method.

06 Hrs

Occupational Health: Safety and occupational health survey, notified and general miners diseases and their preventive measures. Permissible standard of dustiness.

07 Hrs

Vocational Training: V.T. Rules in detail, Indian Electricity Rules applicable to mines, rescue rules in detail.

07 Hrs

Part-B

Safety Rules and Regulations: Standing order in event fire, inundation and failure of main mechanical ventilator.

06 Hrs

Bye-Laws: ANFO Explosive, A.C. mains firing, Bulk transportation of explosives, Diesel Locomotives.

06 Hrs

Accidents: Classification of accidents, statistics, causes and preventive measures. Accident enquiry report for various accidents due to roof fall, blasting, machinery failure etc.,

07 Hrs

Accidental Planning: Collection and presentation of accidental records, zero accidental planning (ZAP) and minimum accidental planning (MAP). Inspection for safety.

07 Hrs

TEXT BOOKS:

Legislation in Indian Mines a Critical Appraisal, Vol. I & II, Rakesh & Prasad, Tara Book Agency, Varanasi, 1999.

Mine Management Legislation and General Safety, Ghatak, Coal Field Publishers, Asansol, 1998.

REFERENCE BOOKS:

DGMS Classified Circulars, Lovely Prakashan, 1998.

V.T. Rules 1966, Bare Act Publishers, 1999.

Indian Electrical rules 1956, Bare Act Publsihers, 1999.

Mine Rescue Rules 1985, Bare Act Publishers, 1999.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINE MANAGEMENT

Sub Code	**: 10MN 82**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

PART-A

Brief History of Management: Evolution of Management, traditional management, Scientific management, Contribution of pioneers to scientific management, Functions of management, Principles of Management. Mine management: Duties and responsibilities of mines manager.

06 Hrs

Organization and Industrial Ownership: Characteristics of Organization, Principles of organization, types of organization, management of conflict, management by exception, management by objective (MBO). Mine organization: Opencast and under ground mines. Industrial ownership: Definition, types of ownership, single ownership, partnership, Joint Stock Companies, co-operatives organization and State and central government owned. Mine ownership: duties and responsibilities of mine owner.

08 Hrs

Personal Management: Functions of personnel management, recruitment and selection of employees. Education and training: mines vocational training center. Communication: formal and informal communication, barriers in communication and techniques to overcome barriers and improve communication.

06 Hrs

Industrial Psychology and Human Relation: Definition, scope of industrial psychology, aims of industrial psychology. Group Dynamics. Motivation: definition, characteristics of motivation, kinds of motivation, factors affecting motivation, motivational techniques, theories of motivation. Maslow's hierarchy of needs, Theory X and Y, Hawthorne experiment.

06 Hrs

PART-B

Industrial Relations and Legislation: Introduction, basic requirement of industrial –relation programme. Trade unions: definition, functions of trade uniosn. Industrial disputes: causes, settlement of industrial disputes, handling of workers' grievances. Workers participation in management, work of ILO. Necessity of labour legislation, principles of labour legislation. Important provisions of factories act, payment of wages act, Workmen's Compensation act, Employee state insurance Act.

08 Hrs

Work Study: Definition, productivity and work study, postion of work study department in the organization, work study man, work study and the workers, work study and the management. Motion Study: Definition, aims of motion study, procedure for motion study, micro motion study, motion economy.

06 Hrs

Time Study: Definition, uses of time study, procedure, performance rating number of cycles to be timed, allowances, uses of time study data for wage incentives. Standard Data: Advantages, Methods for determining Standard Data, Work factor system, Method Time Measurement (MTM), Basic Motion Time Study.

06 Hrs

Management Information System (MIS): Introduction, Need for Information System, Characteristics of Good MIS, Sources of Information, application of MIS, design of MIS, development, Implementation of MIS.

06 Hrs

TEXT BOOKS:

Mine Management, Legislation and General Safety, S. Ghatak, Coal Field Publishers, Asansol, 1999.

Management by Harold Koontz and Heinz Weihrich, Mc Graw Hill Company, 1990.

REFERENCE BOOKS:

Industrial Organization and Engineering Economics, Banga and Sharma, Khanna Publication, New Delhi, 1999.
Legislation in Indian Mines: A Critical Appraisal, Published by Vivek, P-8, New Medical Enclave, B.H.U., Varanasi, 1992.
Modern Production Management, Buffa, John Wiley and Sons, 1998.
Industrial Management, O.P.Khanna, Dhanpat Rai and Sons, 1999.
Mine Management, V.N. Singh, Lovely Prakashan, 2003.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINE TRANSPORT SYSTEM

Sub Code	**: 10MN831**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Classification of Mine Transport Systems and Layouts: Techno – economics Indices, Transport by gravity. Underground conveyor transport. **08 Hrs**

scraper chain conveyor, belt conveyor, special belt conveyor (cable belt) shaker and vibrating conveyors. Scrapper haulage. **06 Hrs**

Rail Track: Construction of rail track, mines car, choice of car, resistant to motion of car, motion of car under gravity, man-riding cars. **06 Hrs**

Rope Haulage: Equipment of rope of haulage, rope haulage calculations, scope of application of a rope haulage. **06 Hrs**

Part-B

Locomotive Haulage: Types of mine locomotives. Load Haul Dumpers. Trackless mining concepts, shuttle cars, mine trucks and their application. **06 Hrs**

Underground Hydraulics: Hydraulic breaking, theory of transportation, hydraulic transportation by gravity and by pumps, equipment. Stowing material, transport.

07 Hrs

Aerial Ropeway: construction of aerial ropeway, Principle of rope way, calculation plan and profile of ropeways.

07 Hrs

Mining Machinery Maintenance: Maintenance management and safety, CAD, remote monitoring and control in mines and automation.

06 Hrs

TEXT BOOKS:

1. Mine Transport 1966- N.T. Karelin, Orient Longmans, 1967.
2. Mine Hoisting – M.A. Ramlu, Oxford IBH, 1996.

REFERENCE BOOKS:

1. Underground Mining Method – W.A. Hastrulid, Society for Mining, Metallurgy & Exploration Inc. 1992.
2. Modern Coal Mining technology, S.K. Das, Lovely Prakashan, Dhanbad, 1996.
3. Design of Supports in Mining, C.Biron & E. Arioglu, John Wiley & Sons, 1983.
4. Mine Pumps and Haulages, S. Ghatak, 1990.
5. Coal Mining Practice, Vol. I to III, I.C.F. Statham, The Coxton Pub. Co. Ltd. 1960.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINING GEOSTATISTICS

Sub Code	**: 10MN 832**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

Introduction to Geostatistics: Definition, Schools of geostatistics. Estimation models for mine evaluation – average method, polygonal or triangular method.

06 Hrs

Deterministic Mathematical Model: Independent random model, trend with random noise, correlated random model and trend with correlated random

residuals.

08 Hrs

Correlated Random Theory-1: Semi Variogram: Definition of semi-variogram, mathematical models of semi-variogram.

06Hrs

Practical problems – Isotropy and anisotropy, stationarity, regularization, nugget effect.

05 Hrs

Part-B

Correlated Random Theory- 2: Extension Variance and Estimation Variance: Extension and estimation variance, calculation of estimation variance, the nugget effect and estimation variance, examples, auxiliary functions. **08 Hrs**

Correlated Random Theory – 3: Kriging: Kriging and optimal valuation, kriging equations in general cases.

06 Hrs

The Integrated Geological – Geostatistical System: Statistical analysis, comparative statistical analysis, geostatistical structural analysis, trend analysis, point kriging cross validation, block kriging, mineral inventory, grade – tonnage relations, examples to assess ore and metal recoveries.

07 Hrs

Example to calculate planning cut-off grade. Optimization of drilling programme. Misclassified tonnages – actual Vs estimated. Grade control.

05 Hrs

TEXT BOOKS:

1. An Introduction to Applied Geostatistics, Issaks and Srivastava, Oxford, IBH, 1990.
2. Mining Geostatistics, Jurnel, A.G. and Huigbregts, Ch. J., John Wiley and Sons, 1978.

REFERENCE BOOKS:

1. An Introduction to Geostatistical Methods of Mineral Evaluation, Rendu J.M. John Wiley and Sons, 1981.
2. geostatistical Ore Reserve Estimation, Dravid, Michel, Mc. Graw Hill, 1977.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

TOTAL QUALITY MANAGEMENT

Sub Code	**: 10MN 833**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

1. **Overview of Total Quality Management:** Introduction – Definition, Basic Approach, Contribution of Gurus – Total Quality Management, TQM framework, Historical Review, Benefits of TQM, TQM organization.

05 Hrs

2. **Leadership:** Characteristics of quality leaders, Deming's philosophy, Role of TQM leaderships – Customers' satisfaction, Customers' perception, Handling customers' complaints, Feedback, Employee involvement, role of Motivation, Suggestion system, Performance appraisal Continuation Process Improvement – Juran's Trilogy, PDSA cycle, Problem Solving methods, Imai's Kaizen, Reengineering, 6 sigma.

08 Hrs

3. **Tool & techniques of TQM:** Bench marking, Definition, Process of bench marking, quality Management Systems, ISO – 9000 series of standards, Implementation and documentation of ISO – 9000, Introduction to QFD and QFD process, Quality by design, rationale for implementation of quality by design, TQM exemplary organization, FMEA (Failure Mode and Effect Analysis), Design FMEA and Process FMEA studies.

07 Hrs

4. **Statistical Process Control:** 7 Basic tools of quality control, Control charts for variables, Construction, interpretation, Analysis using X-R

control charts, process capability estimation, process capability indices, process improvement through problem analysis (Intensive coverage with numerical problems)

06 Hrs

Part-B

5. **Control Charts for Attributes:** Construction interpretation and analysis of P- Charts, NP- Chart, C- chart, U-Chart, Process improvement through problem analysis (Intensive coverage with numerical problems).

08 Hrs

6. **Product Acceptance Control:** Design of Single sampling, Double sampling and Multiple sampling plans, Analysis of the characteristics of the above sampling plans, Selection of sampling plans for Product Acceptance Control through IS 2500 Part 1 and Part 2.

06 Hrs

7. **Reliability and Life Testing:** (Basic treatment only): reliability analysis of components, standard configuration systems like series, parallel redundancy and principles of design for reliability, Precedure for life testing.

06 Hrs

8. **Experimental Design:** One factor designs, two factor designs, Orthogonal Design, Full factorial and fractional factorial design, Thaguchi's philosophy of quality engineering, Loss function, Orthogonal array, signal noise ratio, parameter design, Tolerance design (Basic Conceptual treatment only)

06 Hrs

TEXT BOOKS:

1. Total quality Management by Dale H. Besterfield (Etal), Pearson Education III, Edition – I, Indian Reprint, 2004.
2. Statistical quality control by Grant Levenworth.

REFERENCE BOOKS:

1. Statistical Quality Control by Douglos C. Mantego Mary
2. Total Quality Management Texts Cases by K. Shridhara Bhat, Himalaya Publishing House, Edition I, 2002.
3. quality Control and Total Quality Management – P.L. Jain, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
4. A New American TQM – Four Practical Revolutions in Management, Shoji Shiba, Alan Graham & David Walden, Productivity Press, Portland (USA).

5. Managing for total Quality, N. Loothetis, Prentice Hall of India, New Delhi, 2002.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

DEEP MINING

Sub Code	**: 10MN841**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

1. **Rock Pressure:** Rock pressure in development, rock pressure in stoping, rock burst in stoping and development. **07 Hrs**

2. **Ground Control:** Supports: rigid, yielding, temporary and permanent. Supports for development headings, stopes, shafts, winzes, crosscuts, stowing practices, pack wallings, concreting and self-supporting strata. **07 Hrs**

3. **Mining:** Stope planning, stopping sequence, minimization of rock bursts and their effects, reclamation of collapsed working. **06 Hrs**

4. Development in highly stressed ground, special mining methods.

06 Hrs

Part-B

5. **Ventilation:** Effect of temperature, humidity and barometric pressure in deep mines, sources of heat in deep mines, methods to reduce humidity. Spot coolers air conditioning plant surface and underground. Gases in deep mines, ventilation standards, fire zones, fire seals, key points, precautions against fire.

06 Hrs

6. **Deep winding:** Layouts, cage versus skip hoisting, shaft equipment and multilevel winding.

06 Hrs

7. **Pumping:** Layouts, drainage, position of pump chambers, special pumps, delivery lines, capacity of pumps and pump chambers.

06 Hrs

8. **Personal:** Importance, experience in deep mining, welfare measures etc.,

08 Hrs

TEXT BOOKS:

1. Deep Mining Jackspalding, Mining Publication Limited Inc. 1949.
2. Mine Ventilation and Air Conditioning by H.L. Hartman, Wiley International, 1976.

REFERENCE BOOKS:

1. Mine Ventilation by G.B. Mishra, Oxford University Press, 1996.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINE ENVIRONMENT AND ECOLOGY

Sub Code	**: 10MN 842**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

1. **Introduction:** Definition of Environment and Ecology, Subdivision of ecology ecosystem – classification of ecosystem, structural and functional components of ecosystem, energy flow in the ecosystem. Tropic structure, ecological pyramids.

Bio-Geo-Chemical Cycles: Types, sulphur cycle, Phosphorous cycle, Nitrogen cycle, Carbon cycle, Hydrological cycle. Impact of human on environment. Development and preservation of ecosystem, soil conservation,

soil erosion, afforrestation.

07 Hrs

2. **Mining and the Environment:** Mineral Production, History of environmental problems. Range and importance of environmental problems: Nature of problems factors influencing the nature and extent of environmental impact. Visual Impact; landscape analysis, sources of visual impact, landscape planning.

06 Hrs

3. **Air Pollution:** Nature and effect of the main pollution's: Gaseous pollutants like point source, Non point sources, Dust formation and movement, Measurement and monitoring, ambient measurement, source measurement, monitoring program, effect of air pollution such as greenhouse effect, depletion of ozone layer and its effects.

07 Hrs

4. **Water pollution:** Introduction of various types of water in the mineral industries, Individual Pollutants: Specific pollution problems, such as acid mine drainage, heavy metal pollution, eutrophication, De-oxygenation.

06 Hrs

Part-B

5. **Control of Air & Water Pollution**: air pollution control, control of particulate of point source and non-point sources, control of gases-point and non-point sources and disposal of collected pollutants. Control of water Pollution: Monitoring sampling procedures, water control, handling of polluted water, water treatment water quality standards. **07 Hrs**

6. **Noise Pollution:** Problems of noise, noise sources and levels, remedial measures Ground vibration: Nature of ground vibration from blasting, measurement & recording, prediction of ground vibration levels, effects of ground vibrations.

07 Hrs

7. **Air Blast**: causes of air blast, effects of air blast, remedial measures.

06 Hrs

8. **Tailing Dams:** construction of upstream & down stream tailing dams, construction of centerline methods & their advantages & disadvantages. Problems associated with tailing dams. Reclamation planning. Land use analysis, reclamation techniques, problems, revegetation process.

E.I.A. & E.M.P.: Base line studies, importance of environmental impact assessment, Environmental impact assessment, environmental management plan.

06 Hrs

TEXT BOOKS:

1. Environmental Impact of Mining, C.G. Down Ph.D. and J. Stock, Second Edition Applied Science Publishers Ltd. London, 1980.
2. Environmental management of Mining Operations, B.B. Dhar, Ashish Publishing House, New Delhi, 1986.

REFERENCE BOOKS:

1. Surface Mining Environment and Reclamation A. Hussain Samya, Standard Publishers, 1998.
2. Mine Environment and Management (An Indian Scenario), A.B.Choudhury, Ashish Publishing House, New Delhi, 1992.
3. Environmental Pollution Control Engineering, C.S. Rao, Wiley Eastern Ltd. 1992.
4. Environmental Challenges C.K. Varshney D.R. Srdesai, Wiley Eastern Ltd. 1993.
5. Environmental Issues in Mineral Resources Development K.L. Rai, Gyan Publishing House, 1993.
6. The Impact of Mining on the Environment, Problems and Solutions, Oxford and IBH, New Delhi, 1994.
7. Water Pollution, Causes, effects and Control, P.K. Goel, New Age International Publishers, 1997.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

ROCK EXCAVATION ENGINEERING

Sub Code	**: 10MN843**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Part-A

1. **Introduction:** Concepts and historical developments in rock excavation, factors affecting rock fragmentation, mechanism of rock breakage and fractures. **06 Hrs**

2. **Rock Fragmentation:** Method of rock fragmentation – explosive action, cutting, ripping and impacts. **06 Hrs**

3. **Properties of Rocks for Machine Process:** Application of compression, tensile and multi – axial strength, index test and abrasivity, anistrophy, elasticity, porosity, lamination, bedding joints in rock fragmentation process. **07 Hrs**

4. **Principles of Rock Cutting Technology:** Drilling and its various types i.e., rotary, percussive, rotary – percussive mechanism of rock

percussion, theory of single tool rock cutting, crack initiation and propagation, breakage pattern.

07 Hrs

Part-B

5. Rock cutting pricks, discs and rolls cutter. Water jet cutting. Method of assessing drillability and cuttability of rock.

06 Hrs

6. **Principles of Excavation Machines:** Roadheaders, TEMs' coalface cutters loaders, Bucket Wheel Excavators and Continuous Miners both surface and underground.

08 Hrs

7. **Rock Cutting Tools:** Cutting tool material – different types relative application and their choice, tool shape and size, specific energy consumption, tool wear,

06Hrs

8. Effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

06 Hrs

TEXT BOOKS:

1. Principles of Rock Fragmentation, G.B. Clark, John Wiley and Sons, New York, 1987.
2. Rock Mechanics and Design of Structures, Obert & Duvall, John wiley and Sons, New York, 1962.

REFERENCE BOOKS:

1. S.M.E. Mining Engineering Hand Book, Hartman, Society for Mining, Metallurgy and Exploration Inc. 1982.
2. Introductory Mining Engineering, Hartman, John Wiley International, 1976.
3. Diamond Drilling, C.P. Chugha, Oxford IBH, 1986.

Scheme of Exam: Total **EIGHT** questions are to be asked, **FOUR** from each part. The student has to answer any **FIVE** full questions selecting at least **TWO** from each part.

MINING PROJECT

Sub Code	**: 10MN 85**	**IA Marks**	**: 25**
Hrs/ Week	**: 03**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

Objectives:

1. To encourage the students to work in a group so that they will develop team and leadership qualities.
2. To make the students to learn the preparation of a detailed project proposal, execution of the project and preparation and presentation of a final project report.
3. To develop in the students multi skills.
4. To develop in the students communication skills.

Guide Lines for Project Work:

1. Project can be undertaken in-house or in a industry or in a research / service organization.
2. Generally a Project batch consists of a minimum of 2 students and a maximum of 4 students.
3. The Project Synopsis should be approved within a period of 15 days by a committee consisting of Head of the concerned department as a Chairman and two senior teachers of the department of which one may be the internal guide.
4. The topic of the project may be in the same branch in which the student is studying, or it may be multidisciplinary. It may involve investigation/ analytical study / experimental work / fabrication / Statistical study / simulation etc. it may also be field oriented. The project should be preferably be taken in the latest trends in Engineering and Technology.
5. There should be a project monitoring committee in each department consisting of Head of the Department and two senior teachers of the Department.
6. Attendance for Project Work will be treated on par with any other practical / practical course.
7. Laboratory slot of 4 hours / week as indicated in the scheme is to be provided by the department.
8. The staff members will be shown a load of 3 hours (1 ½ units) for guiding, generally 4 batches of students.