

JHARKHAND RAI UNIVERSITY
RANCHI



SYLLABUS

DIPLOMA
MINING ENGINEERING



SEMESTER II

2025 - 2028

DIPLOMA IN MINING ENGINEERING
SEMESTER II

S.No	Category	Subject Code	Name of Subject	Evaluation Scheme				Subject Total	Periods			Credit	Hours	
				Assign ment	TA	Total	ESE		L	T	P			
1	Basic Science Course	8DBSC104	Basic Physics II	20	10	30	70	100	3	0	0	3	3	
2	Basic Science Course	8DBSC105	Basic Mathematics II	20	10	30	70	100	3	0	0	3	3	
3	Engineering Science Course	8DESC104	Engineering Mechanics	20	10	30	70	100	3	0	0	3	3	
4	Engineering Science Course	8DESC105	Basic Electrical & Electronics Engineering	20	10	30	70	100	3	0	0	3	3	
5	Mandatory Course	8DMC101	Environmental Studies	20	10	30	70	100	3	0	0	3	3	
6	Humanities and Social Sciences	8DHSMC102	Life Skills II	20	10	30	70	100	2	0	0	2	2	
PRACTICAL/DESIGN/DRAWING/SESSIONAL														
1	Basic Science Course	8DBSC104P	Basic Physics II Lab		30	30	20	50	0	0	2	1	2	
2	Engineering Science Course	8DESC104P	Engineering Mechanics Lab		30	30	20	50	0	0	2	1	2	
3	Engineering Science Course	8DESC105P	Basic Electrical & Electronics Engineering Lab		30	30	20	50	0	0	2	1	2	
4	Engineering Science Course	8DESC106P	Workshop Practice II Lab		30	30	20	50	0	0	2	1	2	
								TOTAL	800				21	25

Program: Diploma
Semester: Second
Course: Basic Physics II
Course Code: 8DBSC104

L	T	P	C
3	0	0	3

Course Objective:

- An ability to apply Knowledge of mathematics, science and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulate and solve engineering problems.
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

Unit I

Gravitation: Kepler's laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth.

Unit II

Properties of Bulk Matter: Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity. Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Bernoulli's theorem and its applications.

Unit III

Electrostatics & Magnetism: Electric Charges; Conservation of charge, Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; Equi potential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with dielectric medium between the plates, energy stored in a capacitor. Magnetism: Concept of magnetic field, Biot – Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire, Force between two parallel current-carrying conductors-definition of ampere, straight and toroidal solenoids. Force on a current-carrying conductor in a uniform magnetic field.

Unit IV

Optics & Dual Nature of Matter and Radiation: Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction and dispersion of light through a prism. Scattering of light – blue color of the sky and reddish appearance of the sun at sunrise and sunset. Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Matter waves-wave nature of particles, de Broglie relation. Davisson-Germer experiment.

Suggested Reading:

1. *Engineering Physics – R.K. Gaur & S.L.Gupta*
2. *Modern Engineering Physics- A.S.Vasudeva*
3. *Concept of Physics – H.C.Verma*
4. *Waves & Oscillations – BrijLal&Subramaniam*
5. *A Textbook of Optics – BrijLal&Subramaniam*

Program: Diploma

Semester: Second

Course: Basic Physics II Lab

Course Code: 8DBSC104P

L	T	P	C
0	0	2	1

List of Experiments:

- 1 Find the acceleration due to gravity using Simple pendulum.
- 2 To determine the unknown resistance of given wire using Potentiometer.
- 3 Find the acceleration due to gravity using Kater's pendulum.
- 4 Compare the e.m.f of two primary cells using Potentiometer.
- 5 Determine the elastic constants of the material of a wire using Searle's Method.

Program: Diploma
Semester: Second
Course: Basic Mathematics II
Course Code: 8DBSC105

L	T	P	C
3	0	0	3

Course Objective:

- Apply the principles of differential calculus to solve a variety of practical problems in engineering and applied science.
- Apply the principles of partial differentiation, directional derivatives and double integral.
- To find the velocity and acceleration of a particle moving along a space curve.

Unit I

Probability and Statistics: Definition, Sample Space, Independent and Mutually Exclusive Events, Conditional Probability. Mean, Median, Mode for grouped and ungrouped frequency distribution. Measures of Dispersion Mean Deviation, Standard Deviation, Variance and coefficient of Variance.

Unit II

Complex Number: Definition of complex number, Cartesian polar and exponential forms of complex number, Algebra of complex Number (Equality, Addition, Subtraction, Multiplication and Division) De Moivre's Theorem(without proof), Example based on De Moivre's theorem, roots of complex numbers, roots of unity.

Unit III

Matrices: Definition of a Matrix, Types of matrices, Algebra of matrices(Equality, Addition, Subtraction, Scalar Multiplication and multiplication), Transpose of matrix, Minor and Cofactor of a matrix, Adjoint and Inverse of a matrix.

Unit IV

Three Dimensional Geometry: Cartesian, Polar and Cylindrical Co-ordinates, Direction Cosines and Direction ratios. Distance between points, Equation of planes, Straight lines, and coplanar lines.

Suggested Reading:

1. *Engineering Mathematics* By H.K.Dass
2. *Basic Mathematics Semester II: Dilip Baburao S.chand& Sons.*

Program: Diploma
Semester: Second
Course: Engineering Mechanics
Course Code: 8DESC104

L	T	P	C
3	0	0	3

Course Objective:

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.
- Ability to explain the differential principles applies to solve engineering problems dealing
- With force, displacement, velocity and acceleration.
- Ability to analyze the forces in any structures.
- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyze problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

Unit I

Force Systems: Fundamentals and Force system: Definitions of Mechanics, engineering mechanics, statics, dynamics, kinetics, kinematics, rigid body, scalar and vector, force, SI unit of force, representation of force by vector, Characteristics of a force, effect of a force, Principle of transmissibility, Classification of force system (coplanar & non coplanar), detail classification of coplanar force system (collinear, concurrent, non-concurrent, parallel, like parallel & unlike parallel). Resolution of a force: Definition, Method of resolution, mutually perpendicular components and non – perpendicular components. Moment of a Force: Definition, measurement of moment of a force, SI unit of moment, physical significance of moment of a force, classification of moments according to direction of rotation, Varignon's Theorem. Couple- Definition, SI unit, measurement of moment of a couple, properties of couple. Composition of Force: Definition of resultant force, method of composition of force –Analytical method - parallelogram law, triangles law & polygon law of force.

Unit II

Equilibrium: Definition, condition of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram. Lami's Theorem – statement & explanation, Application of this theorem for solving various engineering problems. Definition of equilibrant, relation between resultant and equilibrant, equilibrant of concurrent & non concurrent force system. Beams – Definition, types of beams (cantilever, simply supported, overhanging, fixed and continuous), types of end supports (simple support, hinged, roller, fixed), classification of load, reaction of a simply supported beam.

Unit III

Friction: Definition: friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction & angle of repose, cone of friction & its significance, types of friction, laws of friction, advantages & disadvantages of friction. Equilibrium of bodies on horizontal and inclined plane: equilibrium of body on horizontal plane subjected to horizontal and inclined force.

Unit IV

Centroid and Centre of gravity: Centroid: Definition of Centroid, moment of an area about an axis, Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle, quadrant of a circle. Centre of gravity: Definition of centre of gravity, centre of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube and rectangular block.

Simple Machine: Definition: simple machine, compound machine, load, effort, mechanical advantage, velocity ratio, input of a machine, output of a machine, efficiency of a machine, ideal machine, ideal load, ideal effort, machine friction, load lost in friction, effort lost in friction.

Analysis: Law of machine, maximum mechanical advantage of a machine & maximum efficiency of a machine, Reversibility of a machine, condition of Reversibility of a machine, self-locking machine.

Study of Simple machine: Calculation of mechanical advantage, velocity ratio, efficiency and identification of reversible or self-locking machine of following machines: Simple Axle & Wheel, Differential axle and Wheel, Worm & Worm wheel, geared, Screw Jack, Pulleys (first, second & third system of pulleys).

Suggested Reading:

1. *Engineering mechanics by d.s. Kumar (katson pub.)*
2. *Engineering mechanics by r.s.khurmi (s.chand)*
3. *Engineering mechanics – by s. S. Bhavikatti, (new age international pub.)*
4. *Engineering mechanics by timoshenko*
5. *A Text book of engineering mechanics m.d. Dayal*
6. *I. H. Shames, engineering mechanics: statics and dynamics, 4thed, phi, 2002.*
7. *F. P. Beer and e. R. Johnston, vector mechanics for engineers, vol i - statics, vol ii – dynamics, 9thed, tata mcgraw hill, 2011*

Program: Diploma

Semester: Second

Course: Engineering Mechanics Lab

Course Code: 8DESC104P

L	T	P	C
0	0	2	1

List of Experiments:

1. To verify the polygon law of coplanar Forces for a concurrent force system.
2. To find experimentally the reactions at the supports of a simply supported beam and verify the same with analytical values.
3. To verify the principle of moments using the bell crank lever apparatus.
4. To determine the coefficient of static friction between two surfaces.
5. To find screw jack and determine the coefficient of friction between the threads of the screw.
6. To estimate the value of acceleration due to gravity using a compound pendulum.
7. To determine the VR, MA and Efficiency of Screw Jack.
8. To determine the VR, MA and Efficiency of worm and worm wheel machine.
9. To determine the VR, MA and Efficiency of Winch Crab.

Program: Diploma

Semester: Second

Course: Basic Electrical & Electronics Engineering

Course Code: 8DESC105

L	T	P	C
3	0	0	3

Course Objective:

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance.
- Ability to perform speed characteristic of different electrical machine.
- To provide knowledge in the basic concepts of Electric Circuits, Electrical machines and Measurement techniques.

Unit I

Electric Current - Ohm's Law - Resistance: Conductor, Insulator, semi-Conductor – Ohm's law – Resistance – Specific Resistance – Conductivity – Temperature coefficient of Resistance – Resistance in series, parallel and series parallel combinations, Calculation of electrical Power and Energy. Conducting Materials : Hardening, Annealing - Low Resistive Materials – requirements – properties and applications of copper and aluminum - Comparison between Copper and Aluminum, High Resistive Materials - properties – applications.

Unit II

Heating Effects of Electrical Current : Mechanical Equivalent of Heat - Heat produced due to flow of current in resistance-applications Magnetic Effects of Electric Current: Lines of force - Field pattern due to long straight current carrying conductor-Field pattern of solenoid and Toroid -Field strength at centre and any point on the axis of a circular current carrying conductor- Field Strength around a straight current carrying conductor- Field strength on the axis of a solenoid-Mechanical force on a current carrying conductor in magnetic field - Direction of force - Fleming's left hand rule -Force between two parallel current carrying conductors – Ampere - Magnetic circuit- Magnetizing force – permeability -flux - reluctance - Magnetization of Magnetic materials - Cycles of Magnetization -B-H Curves - Hysteresis loop - Hysteresis loss - Steinmetz constant -Comparison of Magnetic circuit with electric circuit - Magnetic materials.- classification –Curie Point – Magnetostriction -Soft & Hard - Magnetic materials

Unit III

Electro Magnetic Induction : Faraday's laws - Dynamically and statically induced E.M.F -Lenz's Law & Fleming's right, hand rule -Self and mutual inductance - Co-efficient of coupling - Inductances in series -Energy stored in a magnetic field - Energy stored per unit volume - Lifting power of magnet Electrostatics : Atom, Ion, positive and Negative charges -Laws of Electrostatics – coulomb - Permittivity -Electrostatic induction -Electrostatic field - lines of force -Comparison of electrostatic and magnetic lines of force -Strength of electric field- Flux density -Gauss theorem - Electric potential - potential difference –Polarization - Dielectric Loss - Application of Dielectrics – Dielectric strength - dielectric constant - Capacitance -Capacitor - types - Capacitors in series and parallel – color codes of resistors and capacitors as per BIS.

Unit IV

Insulating Materials: Properties -Insulation resistance - factors effecting Insulation resistance - Classification of Insulation materials - properties – applications. Special Purpose Materials: Protective materials – Thermocouple - Bi-Metals- Soldering- Fuses - Galvanizing and Impregnating. Semi-conductor Devices: Intrinsic and extrinsic semi-conductors, 'P' and

`n' type materials, PN Junction, forward and reverse bias- Zener diode, Zener diode characteristics - formation of PNP and NPN transistors-Transistor configurations- CB, CE - Input and output characteristics of CB,CE - comparison of CB,CE, CC.

Suggested Reading:

1. *Basic Electrical Engineering, Fitzgerald, Hinginbotham*
2. *Basic Electrical Engineering I.J. Nagrath and D.P. Kothari, 2nd Edition, TMH, Delhi.*
3. *Electric circuits- Schaum Series*
4. *Electrical Engineering- Del Toro.*
5. *Basic Electrical Engineering- Mittle.*
6. *Basic Electronics B. Bhasavaraj & H.N Shrivashankar-S.Chand*
7. *Basic Electronics – Arvinda H.S-Vikas Pub.*

Program: Diploma

Semester: Second

Course: Basic Electrical & Electronics Engineering Lab

Course Code: 8DESC105P

L	T	P	C
0	0	2	1

List of Experiments:

1. A basic introduction to laboratory instrument with its specification.
2. To determine the Resistance value using Color-code.
3. To determine the equivalent Resistance in Series & Parallel.
4. To determine Characteristics of PN Junction diode.
5. To determine Characteristics of Zener diode.
6. To Study the characteristics of BJT in CB configuration.
7. To Study the characteristics of BJT in CE configuration.
8. To study the process of soldering.

Program: Diploma
Semester: Second
Course: Environmental Studies
Course Code: 8DMC101

L	T	P	C
3	0	0	3

Course Objective:

- Students understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Students appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

Unit I

Multidisciplinary nature of environmental studies, Natural Resources

Definition, scope and importance need for public awareness.

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies.

Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.

- Equitable use of resources for sustainable lifestyles.

Unit II

Ecosystems, Biodiversity and its conservation

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.

- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- Introduction – Definition: genetic, species and ecosystem diversity.
- Bio geographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III

Environmental Pollution, Social Issues and the Environment

Definition

- Cause, effects and control measures of:-
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disastermanagement: floods, earthquake, cyclone and landslides.
- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmentalethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit IV

Human Population and the Environment, Field work

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.
- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Suggested Reading:

1. G. Kiely – *Environmental Engineering Irwin/ McGraw Hill International Edition, 1997*
2. M. L. Davis and S. J. Masen, *Principles of Environmental Engineering and Science, McGraw Hill International Edition, 2004*

Program: Diploma
Semester: Second
Course: Life Skills II
Course Code: 8DHSMC102

L	T	P	C
2	0	0	2

Course Objective:

To impart basic skills of Professional Communication in English through intensive practice to the Students, so as to enable them to function confidently & effectively in that Language in the Professional Sphere of their life.

The student must have some basic command of English so that the Student must be able to:

- At the end of the course the student should become a good communicator not only in the organization but in day today life also. Should know and learn the dynamics of external and internal communication.
- Use some 2000 (at least 1500) general-purpose words of English to express himself/herself in writing & 1500 such words to talk about day-to-day events & experiences of life.
- Understand slowly-delivered spoken material in Standard Indian English, and
- Speak reasonably clearly (if not fluently) on routine matters with his fellow Students, with proper word stress, intonation pattern, accent and perfect articulation.
- Should have command over the language.

WRITING SKILLS

Unit I

Letter Writing

- Business/official Letters
- Letter Writing Skills
- Planning of the Letter
- Letter Writing Process
- Form & Structure
- Essentials of Letter Writing
- Types of Professional Letters: letter of enquiry, letter of placing order, information seeking letter, letter of claim & complaint, information giving letter, letter of acceptance, letter of rejection

Unit II

Professional Writing

- Job Application, introduction, layout & format (specimen)
- D O letter
- Resume & Job Application
- Covering Letter
- Editorial Letter
- Writing Mails & SMS (E-Language)
- Notice, Memo, Circular & Minutes Writing.
- Social Letters (letters to friends/relatives etc.)

STUDY SKILLS

Unit III

Reading Skills

- Newspaper Reading

- Mechanics of Note making
- Note Making Techniques/ Reduction Devices
- Organization Techniques/Method of Sequencing
- Mechanics of Summarizing
- Outlining & Paraphrasing

Unit IV

Referencing Skills

- Referencing Skills
- Method of Referencing
- Using Foot Notes
- Scanning and Skimming Skills
- Finding required Information/Meaning/ Pronunciation

Suggested Readings:

1. *Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint. Tata McGraw-Hill. New Delhi*
2. *Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates. Prentice Hall Press. New York*
3. *Lewis, Norman. 1991. Word Power Made Easy. Pocket Books*
4. *Sen , Leena .Communication Skills ; Eastern Economy Edition*
5. *Ghanekar , Dr. Anjali . Essentials of Business Communication Skills ; Everest Publishing House*
6. *David Green . Contemporary English Grammar, Structure & Composition ; MacMillan*
7. *Dictionary; Oxford*
8. *Dictionary ; Longman*

Websites

- www.tatamcgrawhill.com/digital_solutions/monippally
- www.dictionary.cambridge.org
- www.wordsmith.org
- www.edufind.com
- www.english_the_easy_eay.com
- www.englishclub.com
- www.english_grammar_lessons.com
- www.wikipedia.org/wiki/english_grammar

Program: Diploma

Semester: Second

Course: Workshop Practice II Lab

Course Code: 8DESC106P

L	T	P	C
0	0	2	1

Course Objective:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.
- Students will be able to use their skills during their project work.
- Students will be able to understand the practical difficulties encountered in industries during any assembly work.
- Students will be able to do simple electronic and electrical work throughout their carrier.
- Students will be able to rectify simple problem connected with pipe fittings.

S.No.	List of Experiment
1	To study different types of measuring tools used in metrology and determine least counts of Vernier calipers, micrometers and Vernier height gauges.
2	To study different types of machine tools (lathe, shaper or planer or Slotter milling, drilling machines).
3	To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4	To make M.S Plate into required model by T-fitting.
5	To make M.S Plate into required model by V- fitting.
6	To make a double lap joint, using the given mild steel pieces and by arc welding.
7	Preparation of butt joint by using shielded metal arc welding process.

Suggested Reading:

1. *Workshop Technology* S.K. Hajara Chaudhary Media Pro-motors and Publishers, New Delhi
2. *Workshop Technology* B.S. Raghuvanshi Dhanpat Rai and sons, New Delhi
3. *Production Technology* R K Jain Khanna Publishers, New Delhi
4. *Workshop Technology* H.S.Bawa Tata McGraw Hill Publishers,