

Maharashtra State Board of Vocational Examination, Mumbai 400 051

1	Name of Course	Certificate Course in Mechanic Motor Vehicle									
2	Course code	306406									
3	Max no. of Students	25									
4	Duration	2 year									
5	Course Type	Full Time									
6	No. of Days per week	6 days									
7	No. of hours per day	7 Hrs									
8	Space require	Theory Class Room – 200 sqft Practical Lab – 1500 sqft Total – 1700 sqft									
9	Entry qualification	S.S.C. Pass									
10	Objective of syllabus	Be aware of safety precautions and use of safety equipments and use of first aid. Do marking, simple hacksawing, filing, drilling, tapping, reaming, scraping, measuring operations Do servicing, Overhauling, lubrication work, wheel alignment work, Diagnose, Dismantle, inspect. Repair Trace out faults of engine, gear box, electronic components, electrical wiring and accessories etc. and rectify them. Drive and road test a Motor vehicle. Repair jacks, grease guns, oil spray guns and other shop floor equipment									
11	Employment opportunities	The student can get jobs in industries relates with automobile or with working experience will be in a position to start his own independent Business.									
12	Teachers Qualification	For Vocational Subject -B. E. Automobile or Equivalent and For Non Vocational Subject Master Degree in concern Subject.									
13	Teaching Scheme –										
	Sr.	Subject	Subject Code	Clock Hours / Week					Total		
				Theory		Practical					
	1	English (Communication Skill)	90000001	2 Hrs		1 Hrs			3 Hrs		
	2	Elective – I	--	2 Hrs		1 Hrs			3 Hrs		
	3	Elective – II	--	2 Hrs		1 Hrs			3 Hrs		
	4	Mechanic (Motor Vehicle)	30640010	3 Hrs		8 Hrs			11 Hrs		
	5	Machine Drawing and CAD	30640011	3 Hrs		8 Hrs			11 Hrs		
	6	Mechanical Technology and Material Science	30640001	3 Hrs		8 Hrs			11 Hrs		
	Total								42 Hrs		
14	Internship	Two Month Summer Internship from 1 st May to 30 th June is Compulsory.									
15	Examination Scheme – Final Examination will be based on syllabus of both years.										
	Paper	Subject	Subject Code	Theory			Practical			Total	
				Duration	Max	Min	Duration	Max	Min	Max	Min
	1	English (Communica-tion Skill)	90000001	3 Hrs	70	25	3 Hrs	30	15	100	40
	2	Elective – I	--	3 Hrs	70	25	3 Hrs	30	15	100	40
	3	Elective – II	--	3 Hrs	70	25	3 Hrs	30	15	100	40
	4	Mechanic (Motor Vehicle)	30640010	3 Hrs	100	35	3 Hrs	100	50	200	85
	5	Machine Drawing and CAD	30640011	3 Hrs	100	35	3 Hrs	100	50	200	85
	6	Mechanical Technology and Material Science	30640001	3 Hrs	100	35	3 Hrs	100	50	200	85
	Total								900		375
16	Teachers – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.										
17	a) For Elective I – Student can choose any one subject Code Subject Name 90000011 Applied Mathematics 90000012 Business Economics 90000013 Physical Biology (Botany & Zoology) 90000014 Entrepreneurship 90000015 Psychology b) For Elective II – Student can choose any one subject Code Subject Name 90000021 Applied Sciences (Physics & Chemistry) 90000022 Computer Application 90000023 Business Mathematics										

Subject Name : English (Communication Skill) - 1st Year

(Subject code : 90000001)

1) PROSE

	TOPIC	AUTHOR	
1	SPOKEN ENGLISH AND BROKEN ENGLISH	GEORGE BERNARD SHAW	
2	THE HOMECOMING	RABINDRANATH TAGORE	
3	WHAT WE MUST LEARN FROM THE WEST	N.R. NARAYAN MURTHY	
4	AFTER 20 YEARS	O .HENRY	
5	THE HAPPY PRINCE	OSCAR WILDE	

2) POETRY

1	IF	RUDYAR KIPLING	
2	BABY'S WORLD	RABINDRANATH TAGORE	
3	POISON TREE	WILLIAM BLAKE	
4	PSALM OF LIFE	H.W.LONGFELLOW	
5	HOPE	SIDDHARTH ANAND	

3) GRAMMER

		EXERCISES
PARTS OF SPEECH NOUNS : KINDS OF NOUNS AND USAGES PRONOUNS PREPOSITIONS ADJECTIVES CONJUNCTION VERB ADVERB INTERJECTION	INTRODUCTION AND EXPLANATION	SENTENCE CORRECTIONS

ARTICLES / APOSTROPHES		
DIRECT /INDIRECT SPEECH		
HOMONYMS/HOMOPHONES		
FIGURES OF SPEECH		
LETTER WRITING – FORMAL AND INFORMAL		
COMPREHENSIONS		
EMAIL AND BUSINESS LETTERS (FORMAT TO BE TAUGHT WHICH IS USED IN WORKPLACE)		
COMPOSITIONS		

4) NON DETAIL

My experiments with truth – M.K.GANDHI

(an autobiography)

5) PRACTICAL

PRACTICALS – 30 MARKS

(BASED ON PERSONAL ENHANCEMENT)(THROUGH SKITS/CHARTS/FLASH CARDS/SKITS/PRACTICAL PROJECT)

OBJECTIVE : GROOMING THE STUDENT TOWARDS HIS CAREER.

AT THE END OF EACH TOPIC, THE STUDENT HAS TO HAVE BENEFITTED FROM IT.

KNOW THYSELF

GOAL SETTING HELP STUDENTS IDENTIFY THEIR OWN GOALS AND THUS LINK TO THEIR CAREERS AS PART OF CURRICULUM

TIME MANAGEMENT

TEAM WORK

INTERPERSONAL COMMUNICATION

GENERAL KNOWLEDGE/ QUIZ BASED ON THEIR SUBJECT

SPOKEN ENGLISH

English (Communication Skill) – 2nd year.

1) PROSE

	TOPIC	AUTHOR	
1	SPEECH AT CHICAGO	SWAMI VIVEKANANDA	
2	THE CASE FOR THE DEFENCE	GRAHAM GREENE	
3	WAITING FOR THE BUDDHA		
4	WATER – THE ELIXIR OF LIFE	C.V.RAMAN	
5	A HORSE AND TWO GOATS	R.K.NARAYAN	

2) POETRY

1	ROAD NOT TAKEN	ROBERT FROST	
2	Even this shall pass		
3	TO INDIA	SAROJINI NAIDU	
4	ALL THE WORLDS A STAGE	WILLIAM SHAKESPEARE	
5	A PRAYER FOR MY MOTHERS BIRTHDAY	HENRY VAN DYKE	

3) GRAMMER

		EXCERCISES
PARTS OF SPEECH NOUNS : KINDS OF NOUNS AND USAGES PRONOUNS PREPOSITIONS ADJECTIVES CONJUNCTION VERB ADVERB INTERJECTION	Different usages on the lines of competitive exams	SENTENCE CORRECTIONS

ARTICLES / APOSTROPHES		
DIRECT /INDIRECT SPEECH		
HOMONYMS/HOMOPHONES		
FIGURES OF SPEECH		
LETTER WRITING – FORMAL AND INFORMAL		
COMPREHENSIONS		
EMAIL AND BUSINESS LETTERS (FORMAT TO BE TAUGHT WHICH IS USED IN WORKPLACE)		
COMPOSITIONS		

4) NON DETAIL

MY EXPERIMENTS WITH TRUTH – M.K.GANDHI

5) PRACTICALS

CAREER CHART.(DEPENDING ON THE STREAM CHOSEN BY THE STUDENT)

ETIQUETTE FOR INTERVIEWS

BODY LANGUAGE

BUSINESS LETTERS

PRESENTATIONS

MARKING SCHEME :

PROSE : 20

POETRY : 15

GRAMMAR : 25

NON DETAIL : 10

PRACTICALS : 30

Elective 1 : Applied Mathematics - 1st Year

(Subject code : 90000011)

Theory	Practical
Detailed Syllabus: 1.0. Trigonometric ratios 1.1. Angles & its measurements 1.2. Trigonometric ratios 1.3. Relation between degree and radian. 1.4. Fundamental identities. 1.5. Examples based on Fundamental Identities 1.6. Trigonometric ratios of compound angles 1.7. Factorization formulae 1.8. Inverse trigonometric functions 1.9. Properties of a Triangle	Detailed Syllabus: Solve problems on: 1) Conversion of radian to degree 2) Conversion of degree to radian
2.0. Plane co-ordinate geometry 2.1. Locus 2.2. Line	
3.0 Vectors and Linear Equalities 3.1. Definition of vector, position vector 3.2. Algebra of vectors (Equality, addition, subtraction and scalar multiplication) 3.3. Dot (Scalar) product with properties. 3.4. Vector (Cross) product with properties. 3.5. Solutions of Linear inequalities in one variable and two variables	
4.0. Determinants and Matrices 4.1. Definition and expansion of determinants of order 2 and 3. 4.2. Cramer's rule to solve simultaneous equations in 2 and 3 unknowns 4.3. Definition of a matrix of order $m \times n$. 4.4. Types of matrices. 4.5. Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication. 4.6. Transpose of a matrix. 4.7. Minor, cofactor of an element of a matrix, adjoint Of matrix and inverse of matrix by adjoint method. 4.8. Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.	Solve problems on Cramer's rule
5.0 Statistics and Probability 5.1. Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. 5.2. Analysis of frequency distributions with equal means but different variances. 5.3. Random experiments: outcomes, sample spaces (set representation). 5.4. Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events 5.5. Probability of an event, probability of 'not', 'and' & 'or' events.	State and prove Baye's theorem

6.0. Set Relations & Functions 6.1. Types of functions 6.2. Domain, Co – domain, Range of a function 6.3. Composite and Inverse functions 6.4. Graphs of functions	Solve problems on Graphs
7.0. Logarithms 7.1. Introduction and Definition 7.2. Laws of logarithms 7.3. Numerical problems based on multiplication, division and power.	Solve problems on power law
8.0. Complex Numbers and Quadratic equations 8.1. Complex Numbers in the form of $a+ib$ 8.2. Modulus, Complex conjugate, Argument of complex numbers 8.3. Algebra of complex numbers 8.4. Square root of complex numbers 8.5. Argand diagram 8.6. Nature of roots 8.7. Sum and product of roots 8.8. Formation of quadratic equation 8.9. Symmetric functions of roots 8.10. Cube roots of unity	
9.0. Sequences and Series 9.1. Definition of a sequence 9.2. Geometric Progression and Arithmetic Progression 9.3. Arithmetic mean, Geometric mean, harmonic mean 9.4. Special Series	1) Proof of arithmetic progression and geometric progression 2) Proof of arithmetic mean and geometric mean
10.0 Permutations and Combinations 10.1. Factorial notation 10.2. Fundamental principle of counting 10.3. Permutation 10.4. Combinations	
11.0 Mathematical Induction and binomial theorem 11.1. History, statement, Proof of Binomial theorem for positive integral indices, Pascal's triangle, general and middle term in binomial expansion 11.2. Principle of mathematical induction and it's application 11.3. Simple applications	Proof of Binomial theorem

Elective 1 : Applied Mathematics - 2 nd Year

(Subject code : 90000011)

Theory	Practical
Detailed Syllabus : 1.0. CALCULUS: Limits and Continuity 1.1. Definition of a limit 1.2. Algebra of limits 1.3. Standard limits 1.4. Limit at infinity and infinite limits 1.5. Continuity of a function at a point 1.6. Algebra of continuous functions 1.7. Continuity in interval 1.8. Continuity of some standard functions	Detailed Syllabus 1) Theorem on a limit of a sequence 2) Theorem on continuity in interval

2.0. Differentiation 2.1. Derivative using first principle 2.2. Rules of Differentiation 2.3. Derivatives of standard functions 2.4. Derivatives of logarithmic and exponential functions 2.5. Derivative of composite functions 2.6. Derivative of Inverse functions 2.7. Derivative of implicit and parametric functions 2.8. Second order derivatives	Proof of derivative using the first principle with the help of an example
3.0. Applications of Derivatives 3.1. Geometrical applications 3.2. Derivative as a rate of change measure 3.3. Approximations 3.4. Maxima and Minima	
4.0. Integration 4.1. Definition of an integral of a function 4.2. Integrals of some standard functions 4.3. Rules of integration 4.4. Indefinite Integration 4.5. Definite Integration	Solve problems on definite integration
5.0 Application of Definite Integrals 5.1. Area under the curve 5.2. Volume of solid of revolution	
6.0. Differential equations 6.1. Definition 6.2. Formation of differential equations 6.3. Solution of first order and first degree differential equations 6.4. Applications of differential equations	Solve problems on first order and first degree differential equations
7.0 Numerical Methods 7.1. Definition of various operators and relation between the operators 7.2. Interpolation methods 7.3. Numerical integration	
8.0. Mathematical Logic 8.1. Statements and logical connectives 8.2. Statement Pattern and Logical equivalence 8.3. Application of logic	
9.0. Geometry 9.1. Pair of straight lines passing & not passing through origin 9.2. Circle: definition, Tangent and Normal 9.3. Conic: Equation of Conics 9.4. Three Dimensional Geometry: Direction Cosines and ratios, Line, Plane	
10.0. Linear Programming Problems 10.1. Linear Programming Problems 10.2. Simplex Method	Solve problems on simplex method
11.0. Boolean Algebra 11.1. Boolean Algebra as an algebraic structure 11.2. Principle of Duality 11.3. Boolean function & switching circuits 11.4. Application of Boolean Algebra to switching circuits	State and explain the principle of duality

Elective - I - Business Economics – 1st year

(Subject Code – 90000012)

Theory	Practical
<p>Detailed Syllabus :</p> <p>1. Introduction to Economics –</p> <p>1.1 Meaning & Scope -</p> <p>1.2 Relevance of Economics to different disciplines - Economics & Management, Economics & Law- Economics and Humanities –</p> <p>1.3 Micro Economics and Macro economics</p>	<p>1) Prepare a project on usefulness of micro – economics.</p> <p>2) Prepare a project on usefulness of micro – economics.</p> <p>3) Conduct a GD on the importance of Micro Economics and Macro Economics</p>
<p>2. Macro Economics –</p> <p>2.1 Meaning, Definition and Features.</p> <p>2.2 Aggregates-Nature of Aggregates , problems of Aggregation.</p> <p>2.3 National Income, Meaning, Definition of National Income Different National Income Concepts</p> <p>2.4. Estimation of National Income – Methods and Difficulties</p>	<p>1) Prepare a PPT presentation on macro-economics, National Income and how it is computed and the difficulties in measuring National Income.</p> <p>2) Prepare a chart on the circular flow of National Income.</p> <p>3) Make a comparative study of closed economy and open economy.</p> <p>4) Conduct a case study of 5 individual families and find out the Disposable income to the individuals.</p>
<p>3. Determinants of Aggregates</p> <p>3.1. Aggregate Demand and their components</p> <p>3.2 Aggregate Supply and their components</p> <p>.</p>	<p>Prepare a chart on the components of aggregate demand.</p> <p>Conduct a GD on Keynes theory of employment and principles of effective demand.</p> <p>Take 2 or 3 case studies on entrepreneurship and discuss to what extent they provide employment to people.</p>
<p>4. Money and Banking</p> <p>4.1 Meaning, definitions and functions of Money</p> <p>4.2 Commercial Banks: Meaning and Functions.</p> <p>4.3 Central Banks: Meaning and Functions.</p>	<p>Find out RBIs concept of money supply.</p> <p>A visit to various financial institutions.</p> <p>A visit to a rural bank, cooperative bank, commercial bank.</p> <p>A visit to the RBI Training college, NABARD OR IDBI</p> <p>Further For the first year the practical will consist developing familiarity with banking functions and will comprise Of what are different types of banking services, facilities, available to individuals/organizations? (to increase the financial literacy)</p> <p>how to open a bank account?</p> <p>different investments like – FD,MF</p> <p>facilities for financial inclusion</p>

5 Public Economics 5.1 Government Budget and the Economy Government Budget – Meaning and its components 5.2 Types of Government Budget – Balanced, Surplus and Deficit.	Prepare a report on sources of revenue in the budget of local Government. Comment. Conduct a GD on last year's government budget. Find out how a private budget/ finance differs from public budget/ finance Prepare hypothetical master budget for an imaginary company and discuss how you have allocated the funds for each department. Prepare a separate budget for production, personnel and administration, finance, marketing, advertising, etc.
6. International Trade 6.1 Comparative cost principal of International Trade. 6.2 Free trade Advantages, Disadvantages 6.3 Protectionist trade advantages, Disadvantages	1) Collect data on India's direction of trade 2) Collect data on India's trade Composition
Theory	Practical
Detailed Syllabus : 7.1. Concepts of Economic Growth and Economic Development 7.2 Indicators of Economic Development Monetary indicators 7.3 Human Development indicators	1) To make a project on discrepancies in India's economic growth and development. 2) Discuss the patterns of education among women in the post independence period. 3) Collect information on Human Development Index for different Indian states.
8.0. Structural Changes in the Indian Economy since 1991. 8.1 Economic reforms since 1991: Need and main features, Liberalization, privatization and Globalization. Their impact on Indian Agriculture, Industries and Service Sector. 8.2 Economic Planning – Meaning and Objectives 8.3 Achievements and Failures of 10th Five – Year Plan	1) Conduct a GD on the New Economic Policy, 19991 and its impact on the various sectors. 2) Visit to Agricultural Produce Market Committee to study the price Fixation of agricultural commodities. 3) Collection of market intelligence of agricultural commodities from newspaper and journals. 4) A visit to a cottage industry, small scale industry, large scale industry. 5) A visit to a MNC. Prepare an assignment on the WTO.
9.0. Current Challenges of Indian Economy 9.1 Problem of Population Explosion in India Causes, Effects and Remedial Measures to remove these problems 9.2 Problem of Poverty in India Causes, Effects and Remedial Measures to remove these problems 9.3 Problem of Unemployment in India Causes, Effects and Remedial Measures to remove these problems	Conduct a GD on population explosion and its impact. Prepare a comparative chart on employment in India during the five year plans. Conduct a GD to find out measures for poverty alleviation. Make ppt presentation on population explosion, poverty, unemployment.

10.0. Infrastructural Development in India 10.1 Transport and Communication, 10.2 Energy, 10.3 Health and Education	Prepare a project report on recent trends in communication. Prepare transport documents of trade namely goods forwarding note, lorry receipt, delivery challan, railway receipt, mates receipt, Bill of lading, airway bill, etc. Conduct case studies on different energy companies like Carin India, Power Corporation of India, Reliance Energy, Coal India Ltd. Collect secondary data on health and education.
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Elective - I - Business Economics – 2 nd year

(Subject Code – 90000012)

Theory	Practical
. Introduction Micro Economics – 1.1 Meaning, Definition ,Nature 1.2 Tools of Analysis, 1.3 Role of Assumptions	1) Conduct a GD on the usefulness of Micro economics 2) Prepare a PPT on the role of assumptions in Economics
Consumer Behaviour and Demand Analysis 2.1 Concept of Utility, Total and Marginal Utility, Law of Diminishing Marginal Utility. Law of Equi – marginal Utility. 2.2 Concept of demand, Types of demand, Determinants of Market demand, Law of demand. 2.3 Price elasticity of demand – Concept and Importance	1) Make a ppt presentation on U, TU, MU, Law of diminishing marginal utility and law of equi – marginal utility. 2) Conduct a GD to substantiate the point that consumer behaviour mainly depends on economic theories. 3) Conduct a case discussion on elasticity of demand. 4) A visit to a mall/ departmental store to study consumer behaviour.
Producer Behaviour and Supply Analysis. 3.1 Meaning of Supply 3.2 Market Supply 3.3 Determinants of Market Supply and Law of Supply.	1) Make a PPT differentiating total output, Stock and Supply concepts. 2) Make chart on law of supply with schedules and supply curve. 3) Prepare a project report on the Law of supply. 4) Conduct a case discussion on the elasticity of supply.
Forms of Market and Price Determination, 4.1 Perfect competition 4.2 Monopoly and Monopolistic Competition – Meaning and Features 4.3 Price Determination under Perfect Competition	1) Conduct a discussion on 'prevalence of one price is the best test of perfect competition' 2) A visit to various markets to study the competition. 3) Write a report on the features of buyers market and sellers market.

<p>Factors of Production</p> <p>5.1 Meaning and Features of Land as a factor of production,</p> <p>5.2 Labour as a factor of production,</p> <p>5.3 Capital as a factor of production,</p> <p>5.4 Entrepreneur, Qualities and functions of entrepreneur.</p>	<p>1) A visit to SISI, DIC to study about entrepreneurship. practical will consist of:</p> <ul style="list-style-type: none"> • Preparing a project report • How to start a business • Collecting information about Permission/ Licenses required from various government agencies/ authorities • Conducting proto type market surveys using the above statistical tools • Preparing questionnaires for different types of market surveys <p>2) Prepare a project report on how to start an industry with financial details.</p> <p>3) Conduct an interview with successful entrepreneurs.</p> <p>4) Prepare a questionnaire for entrepreneurs.</p> <p>5) Find out the problems faced by informal sector labour and prepare a report.</p>
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Section II	
6.1 Meaning, Scope and Importance of Statistics in Economics	<p>1) Analyze the charts and diagram various statistical reports.</p> <p>2) Collect secondary data from journals, magazines and newspapers.</p>
<p>Collection and organization of data</p> <p>7.1 Collection of data – primary and secondary</p> <p>7.2 Methods of data collection – primary methods – Observation, Interview, Methods of secondary data – Census and sampling, Random sampling.</p> <p>7.3 Organization of data – Census and sampling, Random sampling.</p>	<p>1) Preparation of questionnaire for personal survey method, telephone interview and mail survey.</p> <p>2) Select sample respondents and conduct socio – economic survey, marketing survey, etc.</p> <p>3) Choose suitable sampling method to conduct the survey.</p> <p>4) Classification of collected data, tabulation of data and analysis and interpretation of data.</p>
<p>Graphical presentation of Data</p> <p>8.1 Tables – Components and Types</p> <p>8.2 Graphs – Curves, Bar diagrams,</p> <p>8.3 Pie – diagrams.</p>	<p>1) Prepare a project report using statistical techniques, graphs, etc.</p> <p>2) Prepare a bar diagram for the data collected.</p> <p>3) Prepare pie charts.</p>
<p>Measures of Central Tendency</p> <p>9.1 Mean</p> <p>9.2 Median</p> <p>9.3 Mode</p>	<p>1) Solve practical problems of mean, median, etc.</p>

Elective - I PHYSICAL BIOLOGY (Botany & Zoology) – 1st Year
(Subject Code : 90000013)

Theory	Practical
Detailed Syllabus : 1.0. General Biology 1.1. Definition and its concept 1.2. Living World: Nature and scope of Biology 1.3. Cell and Cell division: Structure of the cell, Cell division 1.4. Main features of life and its characteristics (Irritability, Homeostasis, Adaptations, Reproduction and Growth & death. 1.5. Origin and evaluation of life 1.6. Theories of evaluation of life, origin of life, special creation, spontaneous generation, Abiogenesis, Evidences of organic evolution paleontological anatomical & embryological 1.7. Study of Tissues	Study of cells and tissues
2.0. Introduction to Botany 2.1 Origin, development and scope of Botany 1.2 Classification and its need 1.3 Nomenclature 1.4. Taxonomic Hierarchy 1.5. Five Kingdom system of classification 1.6. Two Kingdom system of classification 1.7. Thallophyta, Bryophyta and Pteridophyta 1.8. Gymnosperms, Angiosperms	Study of angiosperms and gymnosperms
3.0. Vegetative Morphology of plants 3.1. Root: Root System – types, modifications of root (storage roots, velaman roots, photosynthetic roots, respiratory roots, parasitic roots, nodular roots) 3.2 Stem: Characteristics and Functions of the stem Modifications of the stems (Aerial – Tendrils, Thorns, Hooks, Phylloclade, Tuberous stems, Bulbils: Sub Aerial – Runners, Stolons, Suckers, Offsets: Underground – Rhizome, Corm, Stem Tuber, Bulb) 3.3 Leaf: Parts and Functions (Types and Modifications of leaf base, stipule, petiole are excluded) Venation Types of leaves (simple and compound) Phyllotaxy (alternate, opposite, Whorled) Modifications of leaves (tendrils, spines, scale leaves, Phyllode, reproductive leaves, trap leaves (details of Nepenthes only)	Study of the structure of a plant (root, stem, leaf)
4.0. Reproductive Morphology of plants 4.1. Inflorescence – Types (racemose, cymose, special) 4.2. Flower – Parts, Sex Distribution, Symmetry, Position of Gynoecium, detailed description of flower (perianth, calyx, corolla, aestivation, androecium – parts, fixation, dehiscence of anther, lengths of stamens, union of stamens), gynoecium – number of carpels, fusion of carpels (excluding variations under syncarpous), ovary – number of locules, placentation, types of styles, stigma.	

SECTION B - ZOOLOGY 5.0. General Biology of Living world 5.1. Main features of life and its characteristics (Irritability, Homeostasis, Adaptations, Reproduction and Growth & death. 5.2. Origin and evaluation of life 5.3. Theories of evaluation of life, origin of life, special creation, spontaneous generation, Abiogenesis, Evidences of organic evolution paleontological anatomical & embryological 5.4. Study of Tissues	
6.0 Diversity of life 6.1 Study and Classification of animals	Classification of animals
7.0. Genetics 7.1. Chromosomal basis of inheritance	
7.0 Study of Phylum: Chordata 7.1 General characters and out line classification of Chordata up to classes with typical examples. 7.2 Fishes: Distinctive features of cartilaginous and Bony fishes with typical examples. 7.3 Amphibia: Distinctive features of Urodela, Anura and Apoda with typical examples	Study of amphibians
8.0 Study of Reptiles, Aves and Mammals 8.1 Reptiles: Distinctive characters of Squamata, Rhynchocephalia, Crocodilia and Chelonia with typical examples. 8.2 Identification of Poisonous and Non- Poisonous Snakes, Poison apparatus, toxicity of Snake venom and treatment of snake bite including the first aid. 8.3 Aves: Distinctive features of Carinatae and Ratitae with typical examples. 8.4 Mammals: Distinctive features of Prototheria , Metatheria and Eutheria.	1) Study of mammals 2) study of reptiles
9.0 Anatomy of Earthworm 9.1. General characteristics of earthworm 9.2. Digestive and reproductive system 9.3. Inter-relation of earthworm with mankind	Study of earthworm

Elective - I PHYSICAL BIOLOGY (Botany & Zoology) – 2nd Year
(Subject Code : 90000013)

Theory	Practical
Detailed Syllabus : SECTION A - BOTANY 1.0. Reproduction in Angiosperms 1.1 Introduction 1.2 Microsporogenesis and development of male gametophyte 1.3 Ovule – structure, types, megasporogenesis, development of embryo sac 1.4 Pollination – Types, Contrivances of cross and self pollination. Agents of Pollination (definition with one example only) 1.5 Fertilization: Post Fertilization changes including seed structure (dicot, Monocot) and types of germination (epigeal, hypogeal & vivipary – definitions with one example)	Detailed Syllabus Study of reproduction in angiosperms in details

1.6 Fruits: – Classification; false fruits, true fruits – simple (fleshy fruits – berry, pome, pepo, hesperidium, drupe: Dry fruits – dehiscent - legume, septicidal capsule, septifragal capsule, loculicidal capsule: Indehiscent – caryopsis, cypsela, nut: schizocarpic – lomentum, schizocarp), Aggregate and multiple fruits	
2.0. Plant Taxonomy 2.1 Introduction – alpha and omega taxonomy , aspects of taxonomy, flora, herbaria, botanical gardens (RBG – KEW , IBG – Kolkatta, NBG – Lucknow), binomial nomenclature, ICBN, Types of classification, Units of classification, brief account of Bentham and Hookers classification 2.2 Study of Malvaceae 2.3 Study of Fabaceae 2.4 Study of Solanaceae 2.5 Study of Liliaceae	
3.0. Internal Organization of plants 3.1 Tissues – Types (meristematic and permanent) and Functions 3.2 Internal Structure of Dicot Root (Primary) and Monocot root 3.3 Internal Structure of Dicot Stem (Primary) and Monocot stem 3.4 Internal Structure of leaf (Dicot and Monocot) 3.5 Secondary Growth in Dicot Stem	Study of monocot and dicot stem
4.0. Genetics 4.1 Introduction to genetics 4.2 Mendel's Principles – Monohybrid, Dihybrid cross, Concept of probability in relation to Mendel's laws 4.3 Linkage and crossing over (only concept and significance) 4.4 Mutations – gene and chromosomal (only definitions of terms: – spontaneous, induced, chromosomal structural and chromosomal numerical changes)	Mendel's principle
SECTION B - ZOOLOGY 5.0. Morphology of Humans 5.1. Nutrition and respiration in man 5.2. Locomotion in man 5.3. Study of Human Skeleton	Study of human skeleton(Bone theory)
6.0 Physiology of Humans 6.1. Circulation 6.2. Osmoregulation and excretion 6.3. Nervous co – ordination 6.4. Hormonal co – ordination	1) Study of hormones 2) study of circulation and excretion(diagrammatic chart)
7.0 Reproduction, growth and development 7.1. Details of Reproduction and human development	Study of reproduction in humans
8.0 Biology in Human welfare 8.1. Aquaculture: List of animals of aquacultural importance in Tabular form only 8.2. Poultry: Poultry farming methods, Layers and Broilers, Poultry diseases (Bacterial,Viral and Fungal - Three each) 8.3. Study of diseases: AIDS, Cancer, Typhoid 8.4. Immunity system 8.5. Biotechnology (Elementary aspects) 8.6. Applications of Biology: Vermiculture and Fishery	Study of various diseases

Subject Name : ENTREPRENEURSHIP – 1st Year

(Subject code : 90000014)

Theory	Practical
Detailed Syllabus : 1.0. Entrepreneurship 1.1. Concept, Functions and need 1.2. Entrepreneurship: Characteristics and Competency 1.3. Relevance of Entrepreneurship to Socio-Economic Gain: generating National Wealth, creating Wage and Self -Employment, Micro, Small and Medium Enterprises, Optimizing Human and Natural Resource and Solving Problems in the path of prosperity, building enterprising Personality and Society. 1.4. Process of Entrepreneurship Development.	Detailed Syllabus I. Study visit by students to any enterprise of own choice. With the help of a schedule/questionnaire the students will record observation regarding – the background of entrepreneur, reasons for selecting the entrepreneurial career, starting the enterprise, the type of enterprise, the process of setting this enterprise, products/services, production process, investment made and marketing practices followed, profit or loss, growth and development, problems faced, institutions/organizations which offer support and entrepreneur's level and type of satisfaction.
2.0. Entrepreneurial Pursuits and Human Activities: 2.1. Nature, Purpose and pattern of Human Activities: Economic and Non-Economic, Need for innovation. 2.2. Rationale and Relationship of Entrepreneurial pursuits and Human Activities.	II. Preparation of a brief report based on the observations made during study-visit to an enterprise.
3.0. Acquiring Entrepreneurial Values and Motivation 3.1 Entrepreneurial Values, Attitude and Motivation-Meaning and concept. 3.2 Developing Entrepreneurial Motivation and Competency – concept and process of Achievement Motivation, Self-efficacy, Creativity, Risk Taking, Leadership, Communication and Influencing Ability and Planning Action. 3.3. Barriers to Entrepreneurship 3.4. Help and support to Entrepreneurs	
4.0. Introduction to Market Dynamics 4.1. Understanding a Market 4.2. Competitive Analysis of the Market 4.3. Patents, Trademarks and Copyright	
5.0. Project Selection 5.1. Product Identification 5.2. Project Formulation	

ENTREPRENEURSHIP – 2nd Year

Theory	Practical
Detailed Syllabus : 1.0. Entrepreneurial Opportunities and Enterprise Creation 1.1. Sensing Entrepreneurial Opportunities 1.2. Environment Scanning 1.3. Market Assessment 1.4. Identification of Entrepreneurial Opportunities 1.5. Selection of an Enterprise 1.6. Steps in setting up of an Enterprise	Detailed Syllabus
2.0. Enterprise Planning and Resourcing 2.1. Business Planning – Preparation of a Project Report 2.2. Resource Assessment -Financial and Non – Financial. 2.3. Fixed and Working Capital Requirement, Funds, Flows, Profit Ratios, Break Even Analysis etc. 2.4. Mobilizing Resources – Sources and Means of Fund, Facilities and Technologies for starting an Enterprise.	
3.0. Enterprise Management 3.1. General management: Basic Management functions. 3.2. Organizing/Production of goods and services – quality, quantity and flow of inputs. 3.3. Managing Market: Meaning, Functions of Marketing, Marketing Mix: * Product * Price * Place * Promotion (advertising and sales promotion). 3.4. Managing Finance – Sources of Long Term and Short Term Finances, Determination of Cost, Income, Calculation of Profit/Loss. 3.5. Managing Growth and Sustenance -Affecting Change, Modernization, Expansion, Diversification and Substitution. 3.6. Entrepreneurial Discipline – Laws of Land, Ecology, Consumer's Concept, Adherence to Contract and Credits.	
4.0. Industrial Relations and Personnel Management 4.1. Meaning, Source of recruitment, Internal/External recruitment procedure 4.2. Incentives, appraisal and training, Industrial relations, Industrial disputes.	
5.0. Report Writing 5.1. Guidelines 5.2. Model project reports	

Subject Name : Psychology – 1st Year

(Subject code : 90000015)

Theory	Practical
Detailed Syllabus : 1.0. Psychology Introduction : 1.1. Definition of Psychology 1.2. Methods of Psychology 1.3. Subfields of Psychology 1.4. Schools of Psychology (a) Old (b) New	Detailed Syllabus I. Study until by student to any organization for differently able person with special needs or a centre for the treatment of the mentally ill. With the help of a questionnaire the student will record observation regarding the type of treatment given, different therapies available at the organization/centre, prognosis of the patients improvement in quality of life, support for previous care given to the patient/clients.
2.0 Memory 2.1 A Theory of General Memory Function 2.2 Information Processing Theories 2.3 The Levels of Processing Theories 2.4 The Organization of Long Term Memory 2.5 Retrieval From Long term memory. 2.6 Forgetting	II. Preparation of a brief report based on the observations made during case study-visit to an organization.
3.0 Learning 3.1 Definition 3.2 Classical Conditioning 3.3 Instrumental Conditioning 3.4 Escape Learning 3.5 Avoidance Learning 3.6 Signature of Instrumental Conditioning 3.7 Cognitive Learning	
4.0 Motivation 4.1 Definition 4.2 Motives as References, Explanations and Predictions. 4.3 Theories of Motivation 4.4 A Normal of Biological Motivation 4.5 Biological Motivation 4.6 Social Motives 4.7 Self-Actualization Motivation 4.8 Frustration and Conflict of motives	
5.0 Personality 5.1 Definition 5.2 Theories of Personality	
6.0 Motivation 6.1 Definition 6.2 Etiology 6.3 Diagnosis 6.4 Clinical Features 6.5 Treatment	
7.0 Perception and Attention 7.1 Definition of Perception 7.2 Sensory Processes 7.3 Illusions 7.4 Attention	

8.0 Emotions 8.1 Definition 8.2 Expression and Perception of Emotions 8.3 Physiology of Emotions 8.4 Stress	
9.0 Intelligence 9.1 Definition 9.2 Intelligence Quotient (IQ) 9.3 Intelligence Testing	

Abnormal Psychology - 2nd Year

Theory	Practical
Detailed Syllabus : 1.0. Abnormal Psychology 1.1. Definition of Psychological Disorder 1.2. Classification of Psychological Disorder	Detailed Syllabus <p>The Main objective of the course in Psychology is to help the students establish a better rapport with their clients. A basic understanding and knowledge of this subject will enable the students to deal with each client as an individual, while also being aware of his/her unique needs. Also, due to the established mind-body connection, some patients requiring Physiotherapy have a Psychological cause as the basis of their physiological symptoms. Severe physiological symptoms requiring therapy can lead to psychological conditions in the patient. Relevant knowledge of psychology can help sensitize the physiotherapist to the needs of the client and treat the patient in a more holistic manner.</p> <p>Such a course would need to have an experimental component in the form of practical work. The objectives of the practical work are :-</p> <ol style="list-style-type: none"> 1. To give the students firsthand experience in field work with hospitals / centers catering to the psycho-physiological needs of patients. 2. To develop in the students the skill and sensitivity to deal with each patient as an individual with his or her own unique need. 3. To guide the students to prepare a project report. 4. To equip the students to make a note of patients psychological conditions in the case history of the patient. 5. To instill in the students the right values and a greater understanding of their patients.

2.0 Schizophrenia 2.1 Definition 2.2 Symptoms 2.3 Subtypes 2.4 Treatment 2.5 Prognosis	
3.0 Paranoia 3.1 Definition 3.2 Symptoms 3.3 Subtypes 3.4 Treatment	
4.0 Manic Depressive Psychosis 3.1 Definition 3.2 Symptoms 3.3 Subtypes	
5.0 Melancholia 5.1 Symptoms 5.2 Treatment	
6.0 Anxiety 6.1 Symptoms of anxiety 6.2 Difference between normal fears and anxiety disorder 6.3 Peripheral manifestations of pathological anxiety. 6.4 Classification of anxiety disorder. 6.5 Treatment	
7.0 Phobia 7.1 Definition 7.2 Symptoms 7.3 Types of phobia 7.4 Treatment	
8.0 Obsessive Compulsive neurosis (OCN) 8.1 Definition of Obsession 8.2 Definition of Compulsion 8.3 Symptoms 8.4 Treatment	
9.0 Hysterical Conversion Disorder 9.1 Definition 9.2 Clinical features (Symptoms) 9.3 Treatment	
10.0 Neurasthenia 10.1 Definition 10.2 Symptoms 10.3 Treatment	
11.0 Personality Disorders 11.1 Definition 11.2 Symptoms 11.3 Classification / Types of Personality Disorders 11.4 Anti-social Personality Disorder (i) Etiology (ii) Treatment	
12.0 Psychotherapy 12.1 Definition 12.2 Types of Psychotherapy	

13.0 Organic Psychosis 13.1 Definition 13.2 Symptoms 13.3 Types of Organic Psychosis (i) Causes (ii) Clinical Features (iii) Treatment (iv) Course and Prognosis	
14.0 Alcohol Related Mental Disorders 14.1 Definition 14.2 Etiology 14.3 Classification 14.4 Treatment and Rehabilitation.	
15.0 Epilepsy 15.1 Definition 15.2 Varieties / Types of epilepsy 15.3 Cause of epilepsy 15.4 Aggravating factors 15.5 Post-ictal disorders 15.6 Epilepsy Vs. Pseudo-seizures 15.7 Status Epilepticus & treatment 15.8 Treatment of Epilepsy	
16.0 Mental Retardation (MR) 16.1 Definition 16.2 Classification 16.3 Etiology 16.4 Diagnosis 16.5 Clinical Features 16.6 Treatment	
17.0 Frustration and conflict 17.1 Definition of Frustration 17.2 Sources of Frustration 17.3 Types of conflict	
18.0 Mental Mechanisms 18.1 Classification	

PRACTICAL (Second Year)

Introduction:

The Main objective of the course in Entrepreneurship is to generate in the students initiative, self reliance and enthusiasm so as to empower them to become entrepreneurs both in spirit and performance. A number of skills such as observation, evaluation, communication, resource mobilization and management, risk assessment, team building etc. is also to be developed in the students. Leadership qualities, sensitivity to business ethics and adherence to a positive value system are the core issues that the course highlights while presenting different concepts related to entrepreneurship.

Such a course should necessarily have a strong experiential component in the form of practical work. The objectives of the practical work are:

- 1 To introduce the students to the world of business by developing in them the core skills and competencies required for an entrepreneur.
2. To develop in the students qualities such as leadership, self-confidence, initiative, facing uncertainties, commitment, creativity, people and team building, integrity and reliability.

3. To enable the students to acquire the skills and knowledge needed for conducting surveys, collecting, recording and interpreting data and preparing simple estimates of demand for products and services.
4. To guide the students to prepare a Project Report.
5. To equip the students with knowledge and skills needed to plan and manage an enterprise through case studies conducted and recorded by the students in different fields such as resource assessment, market dynamics, finance management, cost determination, calculation of profit and loss etc.
6. To instill in the students important values and entrepreneurial discipline.

FORMAT

Total marks: 30

1. Project Report/Survey Report	10 Marks
2. Viva-Voce on PW /SR	05 Marks
3. Case Study	10 Marks
4. Problem Solving	05 Marks

1. Project Report/Market Survey Report

10 Marks

a) Project Report:

Preparation of a Project Report for an enterprise involving products/services Students may be provided adequate guidance to choose a project based on their interests and availability of information and authentic inputs in the locality. The specimen proforma of project report given in the textbook may be used for preparing the report. However, mechanical preparation of the report by filling in the information in the proforma should be discouraged.

Further, as the students will be required to appear for a Viva-voce on the basis of their projects, sufficient care should be taken by the students to prepare the report after studying the various aspects involved thoroughly. In a nutshell, the project report should lead to viable enterprise.

b) Market Survey Report

Market research is the process and technique of finding out who your potential customers are and what they want. The survey may be on products and services already available in the market or students may also conduct surveys for new products and services. The report of the survey should be organised under the following broad headings :

1. Objectives.
2. Methods and tools (interviews ,questionnaires etc.) to be used to collect information.
3. Records of data and information.
4. Analysis of data and information.
5. Interpretation and conclusion.

For example, a survey may be conducted to find out the choice of households in toiletry soap, tooth paste etc. The data may be analysed to establish a pattern that may be useful to an entrepreneur.

Guidelines for assessment of Project Report / Survey Report

1. Presentation: Format, Clarity, Use of graphs, tables and other visuals, organisation, methodical recording of data and information and general neatness of execution. 5 marks
2. Originality and Creativity 3 marks
3. Authenticity of information and correctness of calculations and general feasibility of the project/ sustainability of conclusion drawn in the survey. 2 marks

2. Viva Voce on the Project /Market Survey Report

5 Marks

The questions should establish that the report is the original work of the student and that the student has a reasonably clear understanding of the work carried out by him/her. Entrepreneurial qualities such as leadership, self-belief, creativity, originality, initiative etc. may also be assessed by asking a variety of questions related to the report.

3. Case Study

10 marks

A case study is a focused research on an organisation, enterprise, practice, behaviour or person undertaken to highlight an aspect that the study attempts to examine. For instance, a case study may be conducted on the pollution control methods being employed by an industry. Or a successful industrialist may be chosen as a subject of a case study to analyze and understand the strategies that the industrialist adopted to achieve success.

Ideally, a case study should be conducted on subjects with the objectives of bringing to the fore beliefs, practices, strategies, values etc. that have made them what they are. Such studies help us to understand the way in which great minds think and operate. We may also conduct case studies on failures; why a company collapsed, how a service lost its market etc. From both the types of case study, we learn lessons; how to do something or how not to do something. They also provide valuable insight into the processes involved in an enterprise.

A few topics are suggested for carrying out case studies :

- i) Drawing a profile of a successful entrepreneur.
- ii) Studying a public sector undertaking and highlighting its success/failure, by analyzing the factors responsible.
- iii) Studying a small scale unit in the locality to bring out the procedures and processes adopted by the unit to become a feasible business venture.
- iv) A study of competition in business by choosing two or more rivals in the market and analyzing their strengths and weaknesses.
- v) Take the school itself for a case study and analyze any two aspects of the school plant for chalking out a plan of action: infrastructure, academics, co-curricular activities etc.
- vi) A case study on a thriving fast food shop/restaurant in your locality. What makes it so popular?
- vii) A case study on the ways in which a business unit has mobilised its financial resources.
- viii) A case study on the enterprise management techniques adopted by a business house.
- ix) A case study on the marketing strategies of a successful consumer durable company.
- x) A case study on the financial management of a Public Limited Company.
- xi) A case study on any Specialized Institution that supports and guides the establishment of a small scale unit.
- xii) Studying the balance sheets of two big private companies to assess their trade and credit worthiness.
- xiii) Studying the inventory management of a large manufacturing industry to ascertain the processes involved for optimizing cost.
- xiv) Carrying out a case study on an established industrial house/company to find out the value system of the company and how it fulfils its social commitment/obligations.
- xv) Carrying out a case study on an established industry to ascertain the processes followed to reduce/prevent pollution.
- xvi) Study on environment friendly companies and their contribution to preservation.

Assessment of Case Studies

- | | |
|---|---------|
| i) Presentation: Format, accuracy, clarity, authenticity and general neatness | 7 marks |
| ii) Analysis and Conclusions | 3 marks |

4. Problem Solving

5 marks

In this session, the students will be required to solve a problem in the form of a written test. The examiner may choose any problem related to the units in class XII Text Book and set it for the class. The problem may be in the following areas :

- a. How to scan the environment to establish the feasibility of a project.
- b. Given certain figures showing the consumption pattern of a product, drawing conclusions that have a bearing on similar products.
- c. Carrying out market assessment for a given product/service to ascertain the feasibility factor.
- d. Assessment of Working Capital.
- e. Calculation of total cost of production.
- f. Calculation of break-even point.
- g. Determining location of a manufacturing unit.
- h. Problems in inventory control (calculation of the Economic Order Quantity and carrying out ABC analysis).
- i. Applying Pricing methods to determine the price of a product or service.
- j. Applying promotion mix to plan a sales campaign for a product or service.
- k. Working out a simple budget for a given task or job.

Assessment of Answers

The examiner may prepare five problems which are solved by him/her before they are presented to the students. The student may choose anyone of the problems and solve it, showing the different steps/different reasons involved in the solution. If the problem does not involve actual calculations, it may not have anyone correct answer. So weightage should be given not only to the final answer but to the entire process of problem solving that the student has followed. Originality and innovative spirit should be rewarded. The students should not be penalized for pelling errors, grammatical mistakes etc. as long as the answer is coherent. Where definite formulas are involved, accuracy should be given due weightage.

LIST OF SUGGESTED REFERENCE BOOKS

01. Entrepreneurship – Class XI – C. B. S. E., Delhi.
02. Entrepreneurship – Class XII- C. B. S. E., Delhi.
03. Udyamita (in Hindi) by Dr. M M.P. Akhouri and S.P Mishra, pub. by National Institute for Entrepreneurship and Small Business Development (NIESBUD), NSIC-PATC Campus, Okhla.
04. Trainer’s Manual on Developing Entrepreneurial Motivation, By M.M.P. Aukhori, S.P. Mishra and R. Sengupta, Pub. by (NIESBUD), NSIC-PATC Campus, Okhla.
05. Behavioral Exercises and games – manual for trainers, learning systems, by M. V. Despande, P. Mehta and M. Nandami.
06. Product Selection by Prof. H.N. Pathak, Pub. By (NIESBUD), NSIC-PATC Campus, Okhla.
07. Entrepreneurial Development – Dr. S. Moharana and Dr. C.R.Dash, Pub. by RBSA Publishers, Jaipur.
08. Entrepreneurial Development by S.S.Khanna, Published by S.Chand & Company Ltd., Ram Nagar, New Delhi.
09. Entrepreneurial Development by C.B. Gupta and N.P.Srinivasan, Publisher Sultan Chand & Sons, 1992.
10. Entrepreneurship Development – Principles, Policies and Programmes by P. Saravanel, Publishers Ess Pee Kay Publishing House, Madras.
11. Entrepreneurship, Growth and Development, by Rashi Ali, Pub. by Chugh Publication and Strech Road, Civil Lines, Post Box No. 101, Allahabad-211991.
12. Entrepreneur and Entrepreneurship Development and Planning in India, by D.N.Mishra, pub. by Chugh Publication, Allahabad.
13. Aoudhogik Disha Nirdesh (in Hindi) Pub. by Centre for Entrepreneurship Development, M.P. (CEDMAP), 60, Jail Road, Jhangerbad, Bhopal-462008.
14. Entrepreneur, Industry and Self-employment Project, Part-I and 2(in Hindi), Pub. by Centre for Entrepreneurship Development, M.P. (CEDMAP), 60 Jail Road, Jhangerbad, Bhopal-462008.
15. Small Scale Industry & Self-Employment Projects, Part-I and 2 (in Hindi), Pub. by Centre for Entrepreneurship Development, M.P. (CEDMAP), 60 Jail Road, Jhangerbad Bhopal.

Magazines

01. Udyamita Samachar Patra,(Monthly, Hind), Pub. by Centre for Entrepreneurship Development, M.P.(CEDMAP), 60 Jail Road, Jhangerbad, Bhopal-462008.
02. Science Tec. Entrepreneur (A Bi Monthly Publication), centre for Enterprenurship Development, M.P. (CEDMAP), 60 Jail Road, Jhangerbad , Bhopal -462008.
03. Laghu Udhdyog Samachar.
04. Project Profile by DCSSI.
05. Project Profile by Pub. Centre for Enterpreurship Development, M.P. (CEDMAP), 60 Jail . Road, Jhangerbad, Bhopal-462008.

Elective – II - APPLIED SCIENCE (Physics & Chemistry) – 1st Year

(Subject Code – 90000021)

Theory	Practical
Detailed Syllabus : SECTION A : PHYSICS 1.0. Measurement, Units, and Dimension 1.1 Introduction: Need for measurement, Units and documents, accuracy, precision of measuring instruments. 1.2 Types of Errors: Constant error, systematic error, environment error (errors due to external causes). Error due to imperfection, random error, gross error, percentage error. 1.3 Combination of Error: Error due to addition, subtraction, multiplication, division, powers of observed quantities. 1.4 Units and Dimensions: Fundamental and derived physical quantities, systems of units in SI systems. Rules for writing units in SI, derived units in SI. Multiples and submultiples of SI units. 1.5 Dimensions: dimensional formulae and dimensional equations, dimensional constants and dimensionless quantities, principle of homogeneity of dimensions. 1.6 Application of dimensional method of analysis: Conversion of one system of units into another, to check the correctness of an equation, to derive the relationship between different physical quantities. 1.7 Order of magnitude and significant figures 1.8 Concept of accuracy and estimation of errors	Detailed Syllabus Perform a simple experiment on measurement and error
2.0. Scalars and Vectors 2.1. Introduction to scalars and vectors 2.2. Addition and subtraction of vectors 2.3. Product of vectors	
3.0. Motion & Force 3.1. Definition of Motion, Uniformly accelerated motion along straight line 3.2. Position time graph and velocity-time graph 3.3. Equation of a projectile path 3.4. Time of light, Horizontal range, Maximum height of a projectile 3.5. Definition and types of forces 3.6. Introduction to gravitation, electromagnetic and nuclear forces 3.7. Law of conservation of momentum 3.8. Elastic and inelastic collisions 3.9. Momentum of force, couple and properties of couple 3.10. Centre of mass and gravity 3.11. Conditions of equilibrium of a rigid body	Experiment on gravitational force(example of a ball falling from a certain height)

4.0. Friction 4.1. Origin and nature of frictional forces 4.2. Laws of static and kinetic frictions 4.3. Pressure due to fluid column 4.4. Pascal's law and its applications 4.5. Newton's formula 4.6. Stoke's law 4.7. Equation for terminal velocity 4.8. Bernaulli's principle and its applications	Proof of Stoke's theorem and Bernaulli's principle
5.0. Dynamics 3.1 Introduction, Newton's Law of Motion. 3.2 Application of Newton's laws – Objects suspended by strings, blocks placed in contact with each other on frictionless horizontal surface, apparent weight in a lift. 3.3 Impulse, Law of conservation of linear momentum, Conservation of linear momentum during collision. 3.4 Work, power, energy potential Energy (PE), Kinetic Energy (KE), definition & derivation for both, relation between KE & linear momentum. 3.5 Conservation and non conservative forces, Work energy theorem, law of conservation of energy in case of freely falling body and vertically projected body.	Derivation for Potential energy and kinetic energy
6.0. Sound waves 6.1. Waves and oscillations 6.2. Progressive waves 6.3. Characteristics of transverse waves, longitudinal waves 6.4. Sound as longitudinal wave motion 6.5. Definition of period, frequency, wavelength giving their relations. 6.6. Newton's formula for velocity of sound, laplace's correction	
7.0. Thermal expansion 7.1. Expansion of solids, liquid 7.2. Linear expansion, area and volume expansion 7.3. Thermal conduction, temperature gradient and coefficient of thermal conductivity	Experiment on expansion of solids in a thermal envirnment
8.0. Refraction of light and lens 8.1. Refraction of light: Refraction of monochromatic light, Snell's law, Total internal reflection, Critical angle, Optical fiber, Dispersion of light, Prism formula, Rainbow, Scattering of light 8.2. Wave Theory of light: Huygen's principle, Construction of plane and spherical wave front, Wave front and wave normal, Reflection at a plane surface, Polarization, Plane polarized light 8.3. Interference and Diffraction: Interference of light, Condition's for producing steady interference, Young's experiment, analytical treatment, expression for path difference and fringe width, Measurement of wavelength by bi prism experiment, Diffraction due to single slit, Rayleigh's criteria, Difference between interference and diffraction 8.4. Critical angle, Optical fiber, dispersion of light, Prism formula, angular dispersion and dispersive power	Experiment on Refraction of light using a prism

8.5. Refraction at single curved surface 8.6. Lens maker's equation 8.7. Concept of conjugate foci 8.8. Magnifying power of simple microscope, compound microscope and telescope 8.9. Lens defects	
9.0. Modern Physics <u>Part A – Electrons and Photons</u> 9.1. Discovery of electron 9.2. Charge and mass of electron 9.3. Photo electric current 9.4. Einstein's equation 9.5. Photoelectric cell and its applications <u>Part B – Atoms, Molecules and Nuclei</u> 9.6. Bohr's model 9.7. Hydrogen spectrum 9.8. Laser as a light source 9.9. Wavelength of an electron 9.10. Davisson and Germer experiment 9.11. Elementary idea of electron microscope	

SECTION B – CHEMISTRY 1.0. Basics of Chemistry 1.1. Importance of Chemistry 1.2. Fundamental and derived units and their SI units 1.3. Gay-Lussac's law, Avogadro's law 1.4. Derivation of molecular weight, gram molecular volume 1.5. Stoichiometry Mole concept 1.6. Equivalent weight, Atomic weight, Molecular weight 1.7. Percentage composition and molecular formula 1.8. Numerical based on weight-volume relationship	Solve Problems based on weight – volume relationship
2.0. Atomic Structure 2.1 Characteristics of electron, proton and neutron. 2.2 Rutherford model of an atom. 2.3 Nature of electromagnetic radiation, 2.4 Planck's quantum theory. 2.5 Explanation of photo electric effect. 2.6 Features of atomic spectra. 2.7 Characteristics of hydrogen spectrum. 2.8 Bohr's theory of the structure of the atom. 2.9 Bohr's explanation of spectral lines. 2.10 Failure of Bohr's theory. 2.11 Wave-particle nature of electron. 2.12 de Broglie's hypothesis, Heisenberg's uncertainty principle. 2.13 Important features of the quantum mechanical model of an atom. 2.14 Quantum numbers, concept of orbitals, define an atomic orbital in terms of quantum numbers – shapes of s, p and d orbitals, state Aufbau principle, Pauli's exclusion principle and Hund's rule of maximum multiplicity. 2.15 Electronic configurations of atoms. Explanation of stability of half filled and completely filled orbitals.	Study of Planck's quantum theory and Bohr's theory

3.0 Classification Of Element And Periodicity In Properties 3.1 The concept of grouping elements In accordance to their properties. 3.2 The periodic law. 3.3 The significance of atomic number and electronic configuration as the basis for periodic classification. 3.4 Classify elements into s, p, d, f blocks and discuss their main characteristics. 3.5 Periodic trends in physical and chemical properties of elements. 3.6 Periodic trends of elements with respect to atomic radii, ionic radii, inert gas radii, ionization energy, electron gain energy, electro negativity and valence. 3.7 Variation of atomic radii in inner transition elements.	Study of Structure of periodic table
4.0. Redox Reaction 4.1. Introduction to Oxidation & Reduction 4.2. Electron transfer concept 4.3. Oxidising & Reducing agents 4.4. Redox reactions in aqueous solutions 4.5. Oxidation number and rules for assigning oxidation number 4.6. Balancing of chemical equations	
5.0. Chemical Equilibrium 5.1. Introduction: Reversible and irreversible reactions 5.2. Rate of reaction and factors affecting it 5.3. Chemical Equilibrium 5.4. Laws of Mass action, Equilibrium constant, relationship between K_p and K_c	Numerical problems based on K_p and K_c
6.0. Adsorption: 6.1. Concept of adsorption 6.2. Difference between absorption and adsorption 6.3. Physical and chemical adsorption 6.4. Factors affecting adsorption 6.5. Applications of adsorption	Experiment on absorption(example of a sponge) to give the difference between absorption and adsorption
7.0 Chemical Bonding and Molecular Structure 7.1 Kossel-Lewis approach to chemical bonding. 7.2 Factors favorable for the formation of ionic bond, energy changes in ionic bond formation. 7.3 Crystal lattice energy – calculation of lattice energy – Bom-Haber cycle. 7.4 Crystal structures of sodium chloride and Caesium chloride. 7.5 Properties of ionic compounds. 7.6 Covalent bond – VSEPR theory and predict the geometry of simple molecules. 7.7 The valance bond approach for the formation of covalent bonds. 7.8 Directional properties of covalent bond. 7.9 Properties of covalent bond. 7.10 Different types of hybridization involving s, p and d orbitals and draw shapes of simple covalent molecules. 7.11 Definition of coordinate covalent bond with examples. 7.12 Description of molecular orbital theory of homonuclear diatomic molecules. 7.13 Bonding, antibonding molecular orbitals, o, n bond orbitals, their symmetry. 7.14 Energy diagrams of molecular orbitals of H ₂ , N ₂ and O ₂ .	

7.15 Concept of hydrogen bond – Types of hydrogen bonds, inter and intra molecular hydrogen bonds. 7.16 Effect of hydrogen bonds on some properties of substances with examples. 7.17 Different states of matter in terms of balance between intermolecular forces, thermal energy of particles.	
8.0. S-block, P-block, d-block & F-block elements 8.1. Introduction to S & P blocks 8.2. Position in periodic table, general electronic configuration 8.3. Comparison between alkali and alkaline earth metals 8.4. Sodium occurrence, uses of sodium 8.5. Methods of extraction 8.6. Physical and chemical properties 8.7. Difficulties in isolation of fluorine 8.8. Methods of preparation 8.9. Uses of fluorine	

Elective – II - APPLIED SCIENCE (Physics & Chemistry) – 2nd Year

(Subject Code – 90000021)

Theory	Practical
Detailed Syllabus : SECTION A - PHYSICS 1.0. Electrostatics 1.1 Gauss's theorem, proof and application 1.2 Mechanical force on unit area of a charged capacitor 1.3 Energy density of a medium 1.4 Concept of a condenser 1.5 Capacity of parallel plate condenser 1.6 Effect of dielectric on capacity 1.7 Energy of a charged condenser 1.8 Condensers in series and parallel	Detailed Syllabus 1) Proof of Gauss's theorem 2) Solve numericals on series and parallel plate capacitors
2.0. Current, Electricity and Magnetic effects of electric current <u>Part A – Current Electricity</u> 2.1. Ohm's Law 2.2. Ohmic and non-ohmic resistances , specific resistance, conductance, 2.3. Temperature dependence of resistivity 2.4. Thermistor 2.5. emf of a cell - internal resistance and back e.m.f's 2.6. Kirchoff's laws: statement and explanation, application to wheatstone's bridge for its balance conditions , metre bridge, principle of potentiometer 2.7. Comparison of e.m.f. of cell, determination of internal resistance of a primary cell, Series and parallel combination of cells.	1) Solve numericals on Ohm's law 2) Experiment on wheatstone's bridge

<p><u>Part B – Magnetic effects of electric current</u></p> <p>2.8. Biot Savart's law</p> <p>2.9. Right hand Thumb rule</p> <p>2.10. Magnetic induction at the center and at the point along the axis of circular coil carrying current</p> <p>2.11. Flemming's left hand rule</p> <p>2.12. Definition of Ampere</p> <p>2.13. Ampere's law and its applications</p> <p>2.14. Moving coil galvanometer</p> <p>2.15. Ammeter</p> <p>2.16. Voltmeter</p>	
<p>3.0. Magnetism</p> <p>3.1. Coulomb's inverse square law</p> <p>3.2. Couple acting on a bar magnet placed in a uniform magnetic field</p> <p>3.3. Magnetic moment of a magnet</p> <p>3.4. Expression for Magnetic induction due to a bar magnet on axial and Equatorial lines</p> <p>3.5. Superposition of magnetic fields</p> <p>3.6. Tangent law</p> <p>3.7. Deflection Magnetometer</p> <p>3.8. Comparison of magnetic moments in Tan-A and Tan-B positions by Equal distance method and null method</p>	
<p>4.0. Electromagnetic waves</p> <p>4.1. Electromagnetic waves and their characteristics</p> <p>4.2. Transverse nature of electromagnetic waves</p> <p>4.3. Electromagnetic spectrum</p> <p>4.4. Propagation of electromagnetic waves in atmosphere</p>	
<p>5.0. Electromagnetic Induction</p> <p>5.1. Laws of electromagnetic induction</p> <p>5.2. Eddy currents</p> <p>5.3. Self and mutual induction</p> <p>5.4. Transformer</p> <p>5.5. Coil rotating in uniform magnetic field</p> <p>5.6. Alternating currents</p> <p>5.7. Reactance and impedance</p> <p>5.8. Power in a a.c. circuit with resistance, inductance and capacitance</p> <p>5.9. Resonant circuit</p>	<p>Solve numericals on power in a.c circuit, transformers and resonating circuits</p>
<p>6.0. Semiconductors</p> <p>6.1. Energy bands in solids</p> <p>6.2. Intrinsic and extrinsic semiconductors</p> <p>6.3. p – type and n – type semiconductors</p> <p>6.4. P – N junction diode</p> <p>6.5. LED</p> <p>6.6. Rectifiers</p> <p>6.7. Zener diode as a voltage regulator</p> <p>6.8. Solar cell</p> <p>6.9. Transistor as an amplifier</p> <p>6.10. Oscillators</p> <p>6.11. Logic gates</p>	

7.0 Communication 7.1. Space communication 7.2. Ground, sky and space wave propagation 7.3. Satellite communication 7.4. Line communication 7.5. Two wire lines 7.6. Cables 7.7. Optical communication	Study of various types of cables and wires
SECTION B - CHEMISTRY 6.0. Electrochemistry 6.1 Electrolytes and Non-electrolytes. 6.2 Faraday's laws of electrolysis. 6.3 Galvanic & Voltaic cells representation 6.4 Nernst equation (No derivation) , e.m.f. calculations.	Experiment on faraday's law of electrostatics
7.0 Nuclear Chemistry 7.1 Composition of Nucleus - Isotopes, Isotones, Isobars, Nuclear stability - Factors effecting Nuclear stability, mass defect, binding energy, Average binding energy, N/P ratio, Magic Numbers). 7.2 Radio-active disintegration and its rate-Half-life and average life. 7.3 Natural and artificial radio-activity, disintegration series-Group displacement law-Types of Nuclear reactions (fission and fusion)-Differences between Nuclear and Chemical reactions- Radio-active isotopes and their applications Iodine 131 , Cobalt 60 , Sodium 24 , C 14 and P 30.	Solve numericals on binding energy and half life rate
8.0 Surface Chemistry 8.1 Adsorption and absorption. Physical and chemical adsorption-distinguishing properties- Adsorption of gases on Metals Adsorption from solutions (Elementary treatment). 8.2 Colloidal state:- True and colloidal solutions – Explanation of the terms - Dispersion medium, dispersed phase, lyo-philic and lyo-phobic sols using the examples; smoke, cloud, blood, milk, starch solution and gold sol. 8.3 Emulsions:- Emulsifying agent and emulsification - its applications. Cleansing action of soap. 8.4 Catalysis - Explanation of the terms – Homogeneous and Heterogeneous catalysis – distinctions with suitable Examples-auto catalysis with one example	
9.0. Acids and Bases 9.1 Theories of Acids and Bases Lowry - Bronsted concept Lewis theory of acids and bases. 9.2 Ionic product of water, PH, Buffers - Numerical problems on these, Indicators - Choice of indicators, PH-range and uses. 9.3 Salt hydrolysis - Types of hydrolysis with examples.	Solve numericals on pH value.

10.0 Alkanes, Alkenes, Alkynes and Aromatic compounds 10.1. Introduction and importance of organic chemistry 10.2. General characteristics of organic compounds Classification of organic compounds	
11. Ethers 11.1 Introduction:- Definition 11.2 Classification:- 11.3 Nomenclature and metamerism 11.4 Preparation, Reactions & Uses	Study of Simple and mixed ethers with examples.
12. Aldehydes and Ketones 12.1 Introduction 12.2 Carbonyl Compounds & classification 12.3 Nomenclature of aldehydes and ketones 12.4 Preparation & reaction of Aldehydes and ketones	
13.0 Acids & Esters 13.1. Introduction, Nomenclature, preparation, Reaction and uses of Acids & Esters	Study of various types of acids
14.0. Amines 14.1. Introduction, Classification and Nomenclature 14.2. Preparation of primary amines 14.3. Reaction of amines	
15.0. Biomolecules & Synthetic Fibres 15.1. Introduction 15.2. Carbohydrates and Proteins 15.3. Fats & Oils 15.4. Classification of Fibres 15.5. Preparation of fibres 15.6. Physical properties and uses of fibres	Study of fibres
16.0. Chemistry in application 16.1. Application of Chemicals in Medicine & healthcare 16.2. Application of chemicals in Food preservatives 16.3. Application of chemicals in Agricultural products	

Elective –II - Computer Applications– 1st year
(Subject Code – 90000022)

Theory	Practical
Detailed Syllabus : 1.0. Introduction 1.1. Basic Computer and its structural theory 1.2. Input devices 1.3. Output devices 1.4. Storage devices 1.5. Computer types and their applications 1.6. Computer Software/Hardware	Detailed Syllabus 1.0. Computer basics 1.1. Identification of Keyboard, Printer, Monitor Scanner, Webcam, Microphone, Speaker 1.2. Sample collection of various type of storage devices, specifications and charts
2.0. Operating systems 2.1. Various types of Operating systems 2.2. Comparison between the different types of OS 2.3. Network Operating systems and their features 2.4. Microsoft Disk Operating System, its nature and history. 2.5. Unix, features, merits and demerits in using Unix as OS. 2.6. Microsoft Windows, development & growth of MS Windows, features, merits and demerits of MS Windows. 2.7. MS Windows NT, features, merits & demerits 2.8. System requirements for various Operating Systems 2.9. Windows default icons and their applications	2.0. Practice 2.1. Practice of MS DOS commands 2.2. Installation of MS Windows 2.3. Practice on Add/Remove programs 2.4. Practice on My computer, Display properties, My documents, My Network places
3.0. Microsoft Word 3.1. Introduction to MS Office 3.2. MS Word applications 3.3. Creation of Document and file operations 3.4. Formatting features of document 3.5. Modification/ editing documents 3.6. Inserting images, files, tables, symbols and various attributes 3.7. Creating and formatting of tables 3.8. Mail merge 3.9. Page layout and design features 3.10. Spell & grammar check in documents 3.10. Print preview & printing of documents 3.11. Converting documents to PDF files.	3.0. Documentation 3.1. Create and save a document 3.2. Format the text with different font size, font styles 3.3. Setting up different page sizes, orientation. 3.4. Making various type of documents like Bio Data, letters, project reports 3.5. Printing of documents
4.0. Microsoft Excel 4.1. Introduction to Excel and its applications 4.2. Features of MS Excel 4.3. Outline of Worksheet & Workbook 4.4. Data types 4.5. Study of various menus of MS Excel 4.6. Creation of worksheet, editing worksheets, save, copy & deleting worksheets. 4.7. Functions of MS Excel 4.8. Formulas of MS Excel. 4.9. Types of charts, creation of data Charts, editing and insertion of charts. 4.10. Sort facility 4.11. Interconnecting Charts 4.12. Page setup, printing worksheets, charts... etc. 4.13. Converting Worksheets to PDF files.	4.0. Practice of Worksheets 4.1. Create and save worksheets 4.2. Editing the worksheets 4.3. Formatting worksheets 4.4. Insert charts 4.5. Making worksheets using formulas & functions 4.6. Making worksheets & printing with different formatting effects 4.7. Making worksheets with images, numbers and print them

Theory	Practical
5.0. MS Power point 5.1. General Introduction 5.2. Features & Applications of MS Power point 5.3. Creating Presentations 5.4. Study of different layouts and making presentations using different layouts 5.5. Using different animation effects. 5.6. Add Audio/Voice and visual effects to slides. 5.5. Filtration 5.6. Converting presentations to PDF files. 5.7. Inserting images, symbols to slides	5.0. Power Point practice 5.1. Create Slides of different types 5.2. Running presentations 5.3. Add slide transition effects and run slide show 5.4. Make presentations with audio/visual effects. 5.5. Printing PPT files 5.6. Making PDF format of PPT files
6.0. Networking & Internet Utilities 6.1. General Introduction of Computer Networking 6.2. Requirements/ Applications of Computer Networking 6.3. Layouts of Different Networks 6.4. Study of various Networking components 6.5. Limitations and merits of different topologies 6.6. Study of Server/client concept 6.7. Internet & its applications 6.8. Email and Chatting 6.9. E-trading concepts 6.10. Downloading files (Text and media files)	6.0. Networking practice 6.1. Identifying different network components 6.2. Collecting samples, charts, images of different networking components. 6.3. Installation of Network Interface card 6.4. Getting connected to Internet and accessing the internet 6.5. Creating personalized Email account 6.6. Chatting (Text and Voice chat) 6.7. Searching/surfing for the information in different sites. 6.8. Downloading
7.0. Project work 7.1. Understand the concept of making projects and preparing the project reports. 7.2. Preparation of a project using the software skills learned during the course.	7.0. Project Work 7.1. Making a working model/project using MS Excel/Power Point 7.2. Project Report

Elective –II - Computer Applications– 2nd year

(Subject Code – 90000022)

Theory	Practical
Detailed Syllabus : 1.0. Introduction MS Access 1.1. Objects of learning MS Access 1.2. Applications of MS Access 1.3. Database and Database Management System 1.4. Elements of Database Management System 1.5. Types of Data Bases & the merits & demerits	1.0. Study of overview of MS Access 1.1. Accessing MS Access and its menus to get familiar with it
2.0. Controlling Data Entry 2.1. Restrict Data Entry using field properties 2.2. Establish a pattern for entering field values 2.3. Create a list of values for a field	2.0. Creating Data Tables, Designing Fields and setting field properties
3.0. Joining Tables and creating Queries 3.1. Create Query joins 3.2. Join unrelated tables 3.3. Relate data within a table 3.4. Set Select Query properties 3.5. Create Parameter Queries 3.6. Create Action Queries	3.0. Creating Queries

4.0. Forms & Reports 4.1. Design a Form Layout 4.2. Enhance the appearance of a Form 4.3. Restrict Data entry in forms 4.4. Adding a command button to a Form 4.5. Create a Subform 4.6. Organize report information 4.7. Format the report 4.8. Set Report Control properties 4.9. Control Report pagination 4.10. Summarize Report information 4.11. Add a sub report to an existing report 4.12. Create a mailing label report	4.0. Practicing Forms and Reports 4.1. Creating different forms using different layouts 4.2. Data entry in to the forms 4.3. Creating different Reports using different layouts 4.4. Data formatting in to reports
5.0. Sharing data across applications 5.1. Import data in to Access 5.2. Export data from Access 5.3. Analyze Access data in Excel 5.4. Export Access data to a Text file 5.5. Merge Access data with a Word document	5.0. Practice: 5.1. Import Excel sheets in to Access 5.2. Import Tables in to Access 5.3. Export Access tables in to Excel format 5.4 Export Access data to a Text file 5.5. Merging data
6.0. Study of Application packages 6.1. Introduction to application oriented software packages 6.2. Study of Railway reservation Package 6.3. Study of different modules and menus available in online Railway Reservation Package 6.4. Study of Banking packages 6.5. Study of Library Management packages 6.6. Study of Inventory control packages 6.7. Study of School Management Packages	6.0. Practice 6.1. Collection of different trial packages 6.2. Visiting Organizations to collect different formats and procedures used in the system 6.3. Creating forms and Reports for the different packages using appropriate data bases
7.0. Project work 7.1. Understand the concept of making projects and preparing the project reports. 7.2. Visiting different organizations to have an idea of different packages 7.3. Preparation of a project using the software skills learned during the course.	7.0. Project Work 7.1. Making a working model/project using MS Access 7.2. Project Report

Elective – II - Business Mathematics – 1st year

(Subject Code – 90000023)

Theory	Practical
Detailed Syllabus: 1.0. Logarithms 1.1. Introduction to logarithms 1.2. Laws of logarithm, characteristics and mantissa	Practice: 1. At least 5 to 10 exercises per chapter 2. One home/class assignment per chapter
2.0. Sets, Relations and functions 2.1. Study of Relation, Function 2.2. Types of functions 2.3. Domain, Co – domain, Range of a function 2.4. Composite and Inverse functions 2.5. Graphs of functions	
3.0. Complex Numbers 3.1. Definition of complex numbers 3.2. Line	
4.0 Quadratic Equations 4.1 Nature of roots of Quadratic Equation 4.2 Sum and Product of roots of quadratic equations 4.3 Formation of Quadratic Equations 4.4 Symmetric functions of roots 4.5 Cubic roots unity	
5.0. Determinants 5.1 Determinant of order three 5.2 Applications of Determinants	
6.0. Trigonometric ratios 1.1. Angles & its measurements 1.2. Trigonometric ratios 1.3. Relation between degree and radian. 1.4. Fundamental identities. 1.5. Examples based on Fundamental Identities 1.6. Trigonometric ratios of sum and difference of two angles 1.7. Factorization formulae 1.8. Inverse trigonometric functions 1.9. Properties of a Triangle	
7.0. Plane Co-ordinate Geometry 7.1. Locus 7.2. Line	
8.0 Partition values and measure of dispersion 8.1 Partition values 8.2 Measures of Dispersion	
9.0. Moments Skewness Kurtosis 9.1 Moments 9.2. Skewness 9.3 Kurtosis	
10.0. Bivariate frequency distribution and correlation 10.1. Bivariate frequency distribution 10.2 Bivariate Correlation 10.3 Rank correlation	
11.0. Permutations and Combinations 11.1 Factorial notation 11.2 Principle of counting 11.3 Permutations 11.4 Combinations	

12.0. Probability 12.1 Types of Event 12.2 Addition Theorem 12.3 Conditional Probability	
13.0. Random Variable and Probability Distribution 13.1 Definition and Types of Random variable 13.2 Probability Distribution of random variable 13.4. Risk and uncertainty	
14.0. Commercial Arithmetic 14.1 Commission Brokerage 14.2 Discount 14.3 Insurance	

Elective – II - Business Mathematics – 2nd year

(Subject Code – 90000023)

Theory	Practical
1.Mathematical Logic 1.1 Statements and logical connectives 1.2 Statement pattern and logical equivalence 1.3 Venn Diagram	
2. Matrices 2.1 Definition and Types matrices 2.2 Algebra Matrices 2.3 Inverse of a Matrix 2.4 Solution of Equations	
3. Limit and Continuity 3.1 Definition 3.2 Algebra of limits 3.3 Application of Standard limits 3.4 Continuity of a function at a point	
4. Differentiation 4.1 definition of Derivative 4.2 Derivative from first principles 4.3 Rules of Differentiation 4.4 Derivative of composite functions 4.5 Derivative of Inverse functions 4.6 Logarithmic Differentiate 4.7 Derivates of Implicit functions 4.8 Derivatives of Parametric functions. 4.9 Second order derivatives	
5. Application of Derivatives 5.1 Increasing and Decreasing functions 5.2 maxima and Minima 5.3 Approximation and Error	
6. Integration 6.1 Definition of an integral 6.2 Integral of standard functions 6.3 Rules of Integration 6.4 Methods of Integrations Integration by parts 6.5 Definite Integrals	
7. Differential Equations 7.1 Definition 7.2 Formation of Differential Equations 7.3 Solution of first order and first degree differential equations 7.4 Applications of Differential equations	

1.Theory of Attributes 1.1 Introduction Notation and class frequencies 1.2 Consistency of data 1.3 independence of Attributes 1.4 Association of Attributes	
8. Regression Analysis 8.1 Introduction 8.2. Data and information 8.3. Tabulation of data 8.4. Graphs and diagrams, scatter diagrams, histograms, bar charts...etc 8.5 Equation of lines of regression 8.6 Regression coefficient and its properties	
9. Numerical Methods 9.1 Finite differences 9.2 Interpolation with equal intervals 9.3 Interpolation with unequal intervals 9.4 Numerical integration	
10. Discrete Probability Distribution 10.1 Binomial Theorem 10.2 Binomial Distribution 10.3 Poisson Distribution	
11. Management Mathematics 11.1 linear programming problem 11.2 Assignment problem 11.3 Sequencing	
12. Demography 12.1 Introduction, definition, Uses of vital statistics 12.2 Measurements of Mortality 12.3 Life tables	
13. Index Number 13.1 Introduction 13.2 Definition and Notations of index numbers 13.3 Types of index number 13.4 Construction of index number 13.5 cost of living index number 13.6 Uses of cost of living index number	
14.0. Spread sheets 14.1. Introduction to spread sheets 14.2. Features and functions of spread sheet softwares 14.3. Use and limitations of spread sheet softwares in business 14.4. Apply spread sheet software to the manual work of chartered management accountant.	Practice: 1. Using spread sheet package 2. Entering data in to Spread sheet 3. Making graphs the selected data using Spread sheet packages 4. Using functions and formulas 5. Making accounts using Spread sheet packages

Subject Code : 30640010

Subject Name : Mechanic (Motor Vehicle) - 1ST YEAR

Theory	Practical
General introduction to the course duration of the course and course contents. Study of the syllabus . General rules pertaining to the institute , facilities available, hostel, recreation, medical and library, working hours, time table	Familiarisation with the institute. Importance of the course. machinery used in the course.. Types of work done by the students in the shop floor. Induction and safety training
Importance of safety and general precautions to be observed in the shop. Fire extinguishers used for different types of fire storing & handling of inflammable materials Elementary first aid	Description of safety equipments their use, safety rules to be observed in an automobile repair shop. Accidents their causes up keep of fire extinguishers familiarisation of the tools and machinery available in the shop their use & upkeep. Importance of cleanliness of work spot, tools, Jacks, trays & horses etc.
	Fitting
Systems of measurements conversion of English into metric measurements and vice-versa. Marking material chalk mechanic blue or red lead. Tools used in marking steel rule Try square, calipers, dividers, scribes pric and centre punch ,hammer and chisel. Their uses & maintenance safety precautions in handling grinding machines. Types of hacksaw frames & blades their selection & uses types of files & their uses care & maintenance of files.	Demonstration & use of fitters. Hand tools, marking off with steel rule, calipers, scribes, dividers, dot & centre punch. Chipping in marked lines sharpening of chisels centre punch dot punch for correct angles. Hacksawing & filing to given dimensions filing true and square different types of filing operations.
Types & sizes of drills Cutting angles & speed & feed of drills. Calculation of tap drill sizes, taps & dies Description & use of different types of taps & dies Use of “V” threads. Precautions while using taps & dies. Description & use of different type of scrappers reamers & Emery papers.	Marking & drilling clear & blind holes, safety precautions to be observed while drilling tapping a clear & blind hole Adjustment of two piece dieriming a bush to suit the given pin / shaft. Scrapping a given machine surface.
Construction & method of reading micrometer (Internal & external) & vernier calipers, correct handling of micrometer & vernier calipers. Reading of vernier scale description & use of combination set vernier bevel protector. Care & maintenance of micrometers vernier calipers combination set etc.	Measuring diameters of pistons main journals , crank pins , king pins big & main bearings, cylinder bores with micrometer & vernier calipers, Measuring width & thickness of machined flat & round bars, measuring of value angles with protector head locating of a round bar with centre head.
	Sheet Metal Work
Sheet metal workers hand tools their description of simple soldering and brazing fluxes used for common joints types of sheets metal joints their uses sheet and wire gauges the blow lamp and its uses pipe fitting explanation of various common metal sheets used in sheet metal shop.	Joining of metal parts by soft soldering. Simple marking out on steel metal, cutting, bending and folding. Practice of silver soldering. Pipe bending. Annealing of pipes. Fitting nipples and unions in pipes. Soldering and brazing of pipes

	Servicing and Lubrication Work :
General description of motor vehicles. Major assemblies- description location and function of each. Details of diesel & petrol vehicles and battery operated vehicle.	General servicing of vehicle washing, cleaning, oiling, greasing, and lubrication
Different locking methods and devices used in vehicles hydraulic and screw jacks hydraulic hoist and air compressor their description and uses.	Inspection of under carriage of vehicle tightening all loose bolts and nuts.
Modern locking devices and their uses.	Use of hydraulic jacks, hoist and horsess. Selecting materials for packings, cutting packing and gaskets. Practice and use of common locking devices such as lock nuts, cotter and split pins, rivets, keys, circlips, lock rings, lock washers wire locking and locatings where these are used . Use of modern locking devices such as Engg. Adhesives and chemicals.
	Suspension and Steering Work :
Description of wheels & tyres- types- section of tyres, ply rating , inflation pressure & carring capacity, storage of tyres.	Removing wheels from vehicle dismantling tyres and tubes checking and repairing punctures in tubes, assembling, inflating to correct pressure rotating the wheel in a vehicle, minor repairing of wheels and tyres.
Frames-description & function. Common trouble in conventional suspension system. Types of leaf springs. Different types of shock absorbers-their description, operation & maintenance.	Inspecting the frame checking alightment of frame-servicing of spring. Replacing new bushes for shackle pins. Changing bushes in shock absorbers-cleaning & lubrication of waheel bearing, adjusting wheel bearing.
Description of different types of independent suspension system- Special features in each system. Maintenance and lubrication of front suspension system.	Removing king pins and bushes replacing new bushes and pins after reaming, and lubrication of king pin bushes, changing rubber bushes in the front, independent suspension system.
The front axle-description and function, types of stearing knuckles, arrangement of steering knuckle joint, general lay out of steering linkages.	Inspect and over haul front and rear suspension rear springs, coil springs-Torsion bars. Check up dead axle for alignment.
Description of different types of steering boxes-special features of each, adjustment repair and maintenace of steering boxes. Power steering-description and its advantages.	Inspect and adjust steering linkages, after replacement of worn parts.Alignment of steering wheels with respect to front wheel.
Description of ackermans angle, caster, camber, toe in and toe out on turn, purpose and effects of these angles.	Inspect & overhaul steering boxes-adjusting steering gear back-lash and end play.Check and adjust toe-in, camber angles checking king-pin inclination and caster angle with special gauges
	<u>Brake Work</u>
Arrangements of brakes in cars and trucks- description of hand brake and its purpose. Layout of mechanical and hydraulic braking system in cars.	Adjusting brake pedal play. Dismentling wheel brake assembly- cleaning and inspecrting- adjusting brake shoes for proper clearances. Bleeding hydraulic brakes.

Master cylinders – types including the tandem master cylinder, special features of each functions- common troubles and remedy .	Removing master cylinder – dismantling cleaning and inspection of parts – assembling and testing- bleeding the braking system after cleaning the pipe lines.
Brake lining- types, uses- relining the brake shoes- pre- cautions to be observed. Wheel cylinders- description, function and types. Brakes fluids- description and use types of fluids used.	Dismantling wheel brake assembly – removing old lining and fitting new lining on the brake shoe. removing and cleaning of brake drums inspecting wheel cylinder and brake drums. Fitting new cups and brake hose pipes- re assembling. Adjusting wheel bearings and testing and adjusting all 4 wheel brakes.
Description and advantages of vacuum assisted hydraulic brakes- special features- common troubles in vacuum assisted hydraulic brakes.	Bleeding of vacuum assisted hydraulic brakes- removing and refitting of vacuum boosters- repairs to pipe lines- adjusting the slack in vacuum assisted hydraulic brakes.
Description of air brake system- major components in system, description and purpose of each part, their care and maintenance- troubles in the air brake assembly and their remedy.	Adjusting air brakes- repair to the tank unit, air compressor, wheel brake adjusters- locating air breaks in the brake lines and rectifying- general maintenance and care-
Brake testing- efficiency of brakes- braking distance, weight transference during braking a vehicle- common troubles in brakes and their remedy.	Trouble tracing in braking system of a vehicle- adjusting brakes and balancing all four wheel brakes, precautions to be observed while testing brakes. Points to remember while preparing the vehicle for brake certificate.
	<u>TRANSMISSION WORK:</u>
Layout of transmission system, description of single plate clutch and multiple plate clutch- functions- different types of clutches used in vehicle- their description special features and advantages	Adjusting clutch pedal play- removing gear box and clutch assembly from vehicle. Dismantling clutch assembly cleaning and inspecting parts.
Clutch lining- types- materials used- bonded and riveted lining clutch plate construction, purpose of damper spring- precautions while relining a clutch plate	Removing and fitting of new pilot bearing. Removing and fitting of ring gear in fly wheel. Relining a clutch plate- checking condition of flywheel and pressure plate surface for reconditioning.
Fluid coupling- description operation and advantages of using fluid coupling- common trouble and remedy.	Assembling of pressure plate- adjusting the fingers- checking run out of fly wheel and aligning clutch assembly with flywheel.
The purpose of gear box in vehicle- description and function of a sliding mesh gear box- common troubles in gear box and their remedies.	Dismantling a four-speed sliding mesh gear box. Cleaning inspection of parts for wear/ damage. Assembling the gear box and filling in oil.
Lubrication of gear box, constant mesh gear box- description and advantages.	Dismantling cleaning and assembling of gear shift mechanism- changing oil in gearbox, studying gear ratios in the gearbox.

Universal joints and propeller shaft- open and closed type propeller shaft. Types of universal joints- care and maintenance, constant velocity joints-special features and advantages.	Removing open type propeller shaft from vehicle,. Removing universal joints- cleaning, inspecting-replacing of worn out parts, reassembling and fitting to vehicle. Special precautions while removing torque tube drive shaft.
Description and purpose of different types of rear axles-special feature and advantages of each type, lubrications of rear axles-reasons for oil in brake drums.	Removing rear brake drums and adjusting the wheel bearings in full floating rear axles and semi- floating axles replacing oil seals in rear axles.
Description and functions of final drive assembly-crown wheel and tail pinion-hypoid gear and its lubrication Description of differential and its principle of operation.	Removing rear axles assembly from vehicle, dismantling, cleaning, inspecting parts for wear and damage, cutting packings/gaskets, removing tail pinion and bearings-cleaning and inspection of oil-seals and bearings.
Description and function of differential gears-types- tooth contact and back lash, preloading adjustment . common trouble and their remedy in axle assembly.	Checking tooth contact in crown and opinion and adjusting backlash. Assembling the rear axle and fitting rear axle assembly on vehicles and testing.
Description and purpose of optional fittings such as transfer case-free wheel- power take off- common troubles in these units and their remedy care and maintenance.	Trouble shooting in the transmissions system of vehicle- detecting noises from clutch, gear box, universal joints, and rear axles assembly. Dismantling transfer case from vehicle- cleaning, inspecting, replacing worn parts, reassembling and fitting to vehicle.
	Primary Engine Work
Description of internal and external combustion engines different types of I.C.engines, important working parts in the engine the 4-stroke cycle.	Dismantling of unserviceable engine- cleaning, studying the parts in the engine and assembling the engine, practice in the use of correct tools and right procedure.
Two stroke cycle, difference between 4 store and 2 stroke cycle engine. Description of valve operating mechanism and valve timing. Description and function of valve springs , guide, tappets, valve seals and locks.	Dismantling an unserviceable engine, cleaning of parts in the engine, measuring of cylinder bore-crank pins, main journals, pistons, studying valve-operating mechanism.
Description and function of cylinder block, cylinder head cylinder liners. Reconditioning of cylinder heads.	Checking compression pressure in a running engine, dismantling the cylinder head from the engine decarbonising the cylinder head, removing the valves cleaning reassembling and adjusting tappets.
Description and function of different types of pistons , piston rings and piston pins- common troubles and remedy.	Removing pistons and connecting rods from engine- dismantling cleaning, inspecting checking clearance, installing rings and piston pins.
Description and function of connecting rods materials used for connecting rods-big and end main bearing shells- piston pins and locking method of piston pins –crank shaft- description function and types. Common troubles and remedies.	Removing connecting rod assembly- cleaning, checking bearing clearances replacing bearing shells, setting correct clearance, measuring wear in crank pins and main journals in crank shaft.

Firing order of the engine , crankshaft balancing. Description of the fly wheel and its function, crank case and oil sump.	Assembling crankshaft, main bearing, connecting, rods and piston assembly in the engine. Fitting cylinder head and starting the engine and tuning up engine for smooth, slow speed running.
Engine cooling methods, air and water cooling- radiators pump thermostat and fans- their description, care and maintenance. Reason for engine overheating.	Checking and cooling system for overheating, cleaning radiators, dismantling, cleaning, assembling and testing water pumps, reverse flushing the system and adjusting the fan belt tension.
Need for lubrication of engine parts- Friction, lubricant and its properties, lubrication system, types- full flow and by-pass flow system, components in lubrication system, oil filters and pump —types, their special feature and uses. Types of lubricants and their properties.	Studying the lubrication, oil flow system in engine. Over-hauling oil filters, oil pump and setting the pressure release valves for correct oil pressure. Maintenance and repair in the lubrication system in engine.
Fuel feed system in motor vehicles – description and layout of the system. Description, operation, maintenance of petrol pump, petrol filters and carburetors. Types of fuel and their properties. Petrol injection system. Types of carburetors, special features , - advantages, different adjustments and their purposes.	Simple repair in fuel feed system – overhauling of petrol pump, carburetors, fuel filters and air cleaners. Introduction to petrol injector. Repair to solex and SU carburetors adjusting float level and slow speed adjustments – studying the fuel flow circuit in carburetor.
Explanation of engine tune up, job description of compression and vacuum testing – description of ignition timing setting and slow speed adjustment.	Practice in engine tune up in a vehicle. – testing vacuum and compression of engine, adjusting tappets setting ignition timing and adjusting carburetor for slow speeds.
	<u>Basic Electrical and Electronics Work</u>
Simple electrical circuits series and parallel circuits, Identification of alternating current and direct current meters. Insulators, conductors types of resistance – ohm’s law and its application, Common electrical terms and symbols – primary and secondary cells- lead acid battery –description –construction – common troubles and remedies	Practice in jointing wires and soldering. Forming simple electrical circuits. Measuring of current, voltage and residence. Cleaning and topping up of a lead acid battery. Testing battery with hydrometer. Cell tester. Connecting battery to charger.
Description of electrical circuits –ignition system and the components –purposes of induction coil, condenser, spark plugs. Common troubles in ignition circuits and remedies	Studying electrical circuits in the engine assembly checking loose, open and short circuit in ignition circuits. Cleaning and testing spark plugs. Overhauling of distributor assembly. Checking and setting ignition timing
Description of charging circuits – operation of dynamo and regulator Unit – Ignition warning lamp – trouble and remedy in charging system	Removing dynamo from vehicle- dismantling, cleaning , checking for defects –assembling and testing for motoring action of dynamo and fitting to vehicle.

Description of starter motor circuit - constructional details of starter motor . Solenoid switches . Common troubles and remedies in starter circuit	Removing starter Motor from vehicle and overhauling the starter motor –testing of starter motor
Introduction to electronics – Definition of resistor, capacitor and inductor and their principles of working. Different types of Diodes, transistors, power supply for electronic circuit	Identification of different Electronic Devices, Testing of electronic device, fault finding in Electronic circuits and remedies.

Subject Name : Mechanic (Motor Vehicle) - Second Year

Theory	Practical
Methods of engine repair fitting new liners – types and advantages of liners, procedure of decarbonising and valve reconditioning in an engine – common defects in valves – valves reface and seat angles. Reasons for valve bouncing _importance of correct tappet clearances	<u>Further practice on petrol engine repair work</u> Removing a petrol engine from a motor vehicle – dismantling cylinder head, decarbonising checking valves – cutting valve seats, replacing worn guides and weak springs , assembling valves and cylinder head and adjusting tappet clearance in a side valve engine
Reasons for cylinder wear – methods of reconditioning worn out cylinders. Precautions to be observed while removing and fitting piston and connecting rod assembly in cylinder bore	Removing piston and connecting rods from engine checking cylinder bore wear for ovality and taper. Checking piston ring grooves and cleaning – measuring piston size – removing gudge-on pin and Bushes – checking wear – refitting new bushes and pins
Bearing types- their special advantages and special features – bearing metals, their composition, bearing spread – nip and crush – their purpose, Lubricating pumps. Types and their special features. By pass and full flow oil filters	Checking main and connecting rod bearing, Checking connecting rod alignment, fitting new bearing shells and setting correct oil clearances . Checking and cleaning oil passages in crank shaft and engine block over hauling and testing oil pumps . Cleaning oil filters
A.C. Mechanical Petrol pump Description and operation – electrical pump (S.U . Pump) – construction , operation and care and maintenance.	Cleaning fuel tank and checking for leaks in fuel tank. Overhauling petrol pumps testing petrol pumps for correct pressure vacuum and delivery
Special feature of solex and S.U. carburetors, petrol flow circuits in these carburetors – functions of each component in the carburettors, common troubles and remedies.	Further practice in removing, dismantling, cleaning , inspecting, replacing, worn parts and assembling and fitting of solex and S,U. carburettors. Practice in adjusting the slow speed screw and setting idling speed of engine

Valve timing gears – Timing marks, timing chains and chain tensioners – effects of stretched chains – checking backlash in timing gears	Removing valve timing – cover –checking and correct setting of valve timing replacing timing chains. Checking camshaft, and play and correcting it
Engine Assemble procedure as recommended by Makers –Precautions to be observed while assembling engine components, checking and adjusting engine idle speed with vacuum gauge	Assembling piston and connecting rod assembly, crank shaft , camshaft and timing gears , fitting cylinder head and checking valve tappet clearance , starting and adjusting engine speed
Inlet and exhaust manifold – description and purpose of manifolds, exhaust pipes and silencer box. Constructional details and purpose and types of silencers. Common troubles in exhaust system and their remedy	Removing inlet and exhaust manifold – cleaning carbon and checking for warpage and crack – checking heat control valve in exhaust manifold for proper working. Removing and replacing of new manifold gaskets and checking leakage of exhaust gases. The removing and cleaning silencer and tail pipe and refitting <u>2. Trouble shooting in cooling Lubrication fuel feed and ignition systems.</u>
Step by step method of locating troubles in the lubrication and cooling system. Reasons for engine overheating flow test rate recommended for radiator . Crank case dilution and crank case ventilation	Troubles shooting in cooling and lubrication system. Checking up and connecting oil and water leaks – changing defective packing and gaskets. Testing radiator for leaks – testing thermostat
Systematic procedure of trouble tracing in fuel feed and ignition system in automobile engine – Reasons for excessive fuel and oil consumption	Trouble shooting in fuel feed and ignition system –starting engine- checking air leaks. Repairing of silencer and tail pipes. Adjusting the slow speed of the engine with vacuum gauge.
	Disel Engine Repair Work
History and development of compression ignition engines. Classification of C.I. Engine , Advantages and disadvantages over petrol engines – constructional details of single and Multi –cylinder engine	Practice on unserviceable diesel engine – removing jammed nuts, broken studs and reconditioning damaged threaded holes – removing cylinder head, connecting rods and pistons, cleaning, inspecting and refitting them, Writing reports of damaged parts and repairs to be carried out on engine,
The four stroke and two stroke diesel engine – uniflow and loop scavenging constant pressure and constant volume cycles. Diesel cycle indicator diagrams.	Practice in starting and stopping of stationery and a transport vehicle engine, General maintenance of engines – checking oil, fuel, water levels and accessories of diesel engines
Specification of diesel engine . Materials used for different engine parts , working clearances , compression ratios – valve timing of diesel engines crankshaft , connecting rods, piston , valves and valve operation . The combustion chambers – types , advantages and disadvantages ,. Heater plugs – types uses	Removing cylinder head, pistons connecting rods, cleaning, decarbonising and cylinder head checking, piston clearance, dismantling valve assemble , cleaning , checking and reconditioning valves , assembling valves and adjusting tappet clearances, assembling engine parts and starting the engine after repairs and adjusting slow speeds.

Fuels used in diesel engine specification of diesel fuels importance of clean fuel general layout of the fuel feed system in the stationary and transport diesel Engine	Bleeding fuel lines for Air locks. Repairing fuel leaks in the pipe – lines and unions. Cleaning of oil and Air Filters in diesel engine
Types of fuel injection systems – air injection and air less injection . Fuel feed pumps – Description Operation – Common Troubles And Remedies	Cleaning and servicing of primary fuel filters and pressure , stage filters – removing feed pump – dismantling, cleaning , reassembling refitting and testing and feed pump
Need for governors types pneumatic and mechanical governors. The pumps phasing and calibration of pumps. Checking and fixing injection timings. Governors types their description and operation. Starting and adjusting slow speed.	Dismantling an unserviceable fuel injection pump clearing inspecting, studying parts and reassembling. Removing F.I pump from running engine changing oil in it cutting back to engine testing the governor and setting injection timing.
Injector nozzles- types description, operation testing of injectors. Special; features of pintle nozzles.	Testing injection for missing on the vehicle-removing, dismantling, cleaning, inspecting – replacing defective parts – reassembling the injectors and testing them.
Need for governors- types- pneumatic and mechanical governors, maintenance of governors reason for black, white and blue smoke in exhaust.	Trouble shooting with special reference to adjustments in the fuel feed system- checking exhaust gases- and adjusting the governor slow speed adjustment and venturi control adjustments. Checking oil, fuel water and exhaust gas leaks and correcting them.
Timing of injection in single cylinder engine.flange type pumps and their special features. Care and maintenance of single cylinder pumps.	Further practice on cleaning and servicing of injectors, adjustment of tappets and setting injection timing in engines(Both stationary and transport vehicles engines.
	Electrical/ Electronic Accessories Repair Work
Description of light circuits and different components in light circuits- description and function of each. Prefocussed bubbles and sealed beams. Fuses and their importance.	Studying the light circuit- test bulbs, align head lamps, find out short and open circuits in the light wiring- replacing fuses testing the tail and brake lights in vehicle.
Electric horn circuit- description of electric horn- operation of relay and horn switches. Common troubles and their remedies.	Removing and electrical horn from vehicle-dismantling.,cleaning point, testing wires, assembling the horn and adjusting the horn for correct sound, tuning double horn, repairing of horn relay and horn switches.
Description and operation of electric wiper motor care and maintenance. Common troubles and remedies.	Removing a wiper motor dismantling, cleaning, inspecting, repairing electrical wiper motors, assembling and fitting, setting blades for correct functioning.
Flasher circuit its description and operation common, troubles in the circuit and remedies .magnetos ignition system- description and operation advantages rotating armature and flywheel magnetos special features.	Studying the wiring circuit of traffic signal flasher light circuit tracing defects in the tracing defects in the flasher circuit replacing fuse bulb.removing dismantling cleaning and assembling magnetos-adjusting gap in points- testing magnetos.

Description and operation of alternators in vehicle. Advantages of using alternators. Common troubles and remedies.	Studying the alternators in vehicle- removing and refitting alternator in vehicle precautions to be observed while connecting battery in alternation circuit. General maintenance, adjusting fan belt play/ tension
Positive and negative earthing of battery- advantages and precautions. Electrical measuring meters their use care and maintenance.	Further practice in dismantling cleaning, testing and reassembling of starter motor and generators . overhauling of distributor assembly.
Lucas- color code for wiring in the ; motor vehicles. Binary numbers logic gates, amplifiers and multi vibrators.	Trouble tracing in electrical wiring of the vehicle. Use of resistance meter, voltmeter and ammeter. Attending mechanical repairs to electrical accessories such as fuel gauge, temperature gauge, brake light switch, and solenoid switch.
Principle of electronic ignition advantages types of electronic ignition system as capacitor discharge ignition system thyristor based ignition system and microprocessor based contactless ignition system.	Tracing fault in different electronic ignition systems and rectification
	Driving Practice
<u>Motor vehicle Act :</u> Driving road rules – Road traffic signals – hand signals. Precautions to be taken while overtaking, reversing driving through narrow lanes, curves and slopes.	Practice in straight driving on wide roads. Driving through lanes and curves. Practice in reversing. Practice overtaking another vehicle. Practice in driving through sand and wet surface. Practice in parking vehicles, parallel parking and diagonal parking. Practice in driving over slope and down hill. Practice in driving over narrow bridges.
	Synchromesh Gear Box and Transfer Case 4 Wheel Drive Prepare Work
Synchromesh gear boxes – advantages – description , operation in different gear positions. Common trouble and remedies. Types of Synchromesh gear boxes- their special features.	Dismantling a Synchromesh gear box- cleaning, inspecting parts replacing worn out defective parts – assembling and testing for correct performance, identifying noises from gear box and rectifying.
Description and operation of 4 wheel drive. The purpose of transfer case and the arrangement of shifting mechanism. Common troubles and remedies.	Removing transfer case from the vehicle – dismantling, cleaning, inspecting parts, replacing worn/ damaged parts, re-assembling, testing and fitting. Repairing of 4 wheel drive shifter mechanism. Overhauling of front wheel drive propeller shaft unit.
Systematic procedure of locating noises from the transmission units – common troubles in the system and their remedies.	Trouble shooting in the transmission system identifying the noises from clutch, assembly, gearbox, universal joints- rear axle drive and the differential unit. Checking oil leaks and correcting.

	Engine Fault Dygnosis Including Engine Scaning
Different types of noises coming from engine – bearing knock, gudgeons pin knock, pinging, tappet noise, chipping noise.	Diagnosing noises and faults in engine and rectifying them – checking under carriage noises and rectifying them. Road testing vehicle.
Introduction to engine tuning, study engine torque, fuel consumption, duel angle exhaust gases etc.	Test Duel angle, Engine tuning and exhaust gases analysis. Demonstration of engine efficiency with the help of Dynamometer
	Servicestation Equipments And Wheel Balancing
Garage equipment construction and operation of air compressor, spark plug tester, valve refacer, injector tester, drilling machine care and maintenance.	Repairs of jacks, grease guns, oil spray guns, other spray guns and other shop floor equipment. Care and maintenance and lubrication of air compressor, valve refacer, drilling machine, injector tester , spark plug tester.
Importance of wheel balancing. Details of equipment and method.	Wheel balancing and use of equipment.
	Car Air Conditioning System Repair and Maintenance
Introduction to Air conditioning system in Motor vehicle. Compatibility of Air conditioning system with vehicle engine.	Fitting and repairing air conditioning unit in motor vehicle. Tuning engine with respect to the Air conditioning.

List of Tools and Equipment

Sr.No.	Description
	Tool Kit
1.	Hammer ball peen 0.75 kg
2.	Chisel cold flat 19mm
3.	Center punch 1mm dia x 100mm
4.	Steel rule 15 cm english and metric
5.	Screw driver 30 cm x 9mm blade
6.	Screw driver 20 cm x 9 mm blade
7.	Spanner D.E.set of 12 pieces(omm-32mm)
8.	Plier combination 15cm
9.	Hand file 20cm second cut
10.	Feeler gauge 20 blade(metric)
11.	Ring spanner set of 12 pieces(omm-32mm)
12.	Steel tool box with lock and key (folding type) size 400x 200x150 mm
13.	Allen key set of 12 pieces (2mm- 14mm)
14.	Circlip plier(ext. and int) 150 mm and 200 (two each)
15.	Philips screw driver type sets of 5 pieces100- 300 mm

Tools, Measuring Instrument and General Shop Out Fit:-

1.	Rule steel 300 mm
2.	Divider spring joints150 mm
3.	Prick punch 15 cm
4.	Chisel cross cut 200 mm x 6mm
5.	Hammer ball peen 0.5 kg
6.	Hammer copper 1 kg with handle
7.	Engineers square 15 cm blade
8.	Scriber 15 cm
9.	Scriber block universal
10.	Marking out tables 90 x 60 x 90 cm (high)
11.	Surface plate 60 x60 cm
12.	Hacksaw frame for 30 cm blade
13.	‘V’ block 75 x 38 mm pair with clamps
14.	Punch, hollow, 6, 7, 8, 9, 10.5 & 12mm set
15.	Punch figure set 3 mm
16.	Punch letters set 3mm
17.	Hand vice 37 mm
18.	Screw driver, electrician type 15 cm size
19.	File, flat 35 cm bastand
20.	File, flat 25 cm second cut
21.	File flat 20 cm smooth
22.	File, flat safe edge 25 cm smooth
23.	File, triangular 15 cm second cut

24	File half round 20 cm second cut
25	File, square 30 cm rough
26	File square 20 cm second cut
27	Twist drill , metric 3 mm to 12 mm(1mm step)
28	Taps and dies complete sets in box metric with handle
29	Hand reamer, adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 mm to 14.25 mm & 14.25mm to 15.75 mm
30	Scraper flat 25 cm
31	Scraper triangular 25 cm
32	Scraper half round 25 cm
33	Sets of more sockets MT 0.1,1.2 & 2.3
34	Micrometer outside 25- 50 mm
35	Micrometer outside 0- 25 mm
36	Micrometer outside 50 – 75 mm
37	Micrometer outside 75 – 100 mm
38	MICROMETER inside 50 –75 mm & 150mm & 25 mm & 150 mm
39	Vernier caliper 200 mm inside, outside depth
40	Safety goggles
41	Hammer planishing
42	Setting hammer
43	Mallet (wooden)
44	Trammel 30 cm
45	Blow lamp 0.5 liter
46	Soldering iron 120 watts
47	Pliers nose (round and straight) 150 mm and 200 mm
48	Soldering iron copper 225 gms (fire rated 150 mm and 200 mm)
49	Snip straight 250 mm
50	Spanner double ended set of 12 metric size 6 to 32 mm
51	Spanner off set double ended set of 6 pcs. (6mm to 17 mm)
52	Double open ended ignition spanner set of 15 (0 to 9 mm)
53	Spanner adjustable 20 cm
54	Spanner ring of set of six(sae)
55	Spanner for sparking plug 14 mm
56	Magneto spanner set of 8 spanner
57	Spanner socket set 6-32 mm sockets (complete set)
58	Spanner T. Flex for screwing up and unscrewing in accessible position
59	Double open ended tappet spanner
60	Drift copper 10mm dia x 150mm
61	Spray Gun- Kerosene
62	Pressure grease gun
63	Chain pulley block –3 ton capacity
64	Tray cleaning 45x30 cm
65	Drilling machine(bench) 12 mm dia
66	Oil can 0.5 liter
67	Lifter, valve spring
68	Tool, valve grinding suction type(consumable tool)

69	Valve seat cutting tools complete with guides and pilot bar(all angles) in a box
70	Extractor, stud 'ezy out' type
71	Compression gauge to read 17.6 kg/ sq.cm
72	Vacuum gauge 0 to 75 cm
73	Stone, carborandom 15x 5x3.75 cm rough and smooth
74	Cylinder dial gauge
75	Torque wrench(0 to 67.5 kg meter) set of 3
76	Work bench240x 120x 75 cm with 4 vices 12.5 cm jaw
77	Lockers with 8 drawers (standard size)
78	Metal rack 180x 150x 45 cm
79	Fuel pump
80	Distributor)old for practice
81	Carburetor(two different types)
82	Water pump and oil pump
83	Filling jig for adjusting the piston ring gap
84	Steel almirah 180x 90 x50 CMS
85	Blackboard 180x90cm
86	Desk or table 90x 60 cm(for Instructor)
87	Fire extinguisher
88	Fire bucket with stand
89	Tachnometer
90	Jack, hydraulic Hi- Lift type(trolley type)
91	Tester sparking plug NEON type
92	Compressor air piston type(vehicular)
93	Wheel alignment gauge magnetic type with turn tables
94	Sectionised engine gear box and differential mounted on chassis
95	Brake assembly , master cylinder, wheel cylinder and servo
96	Vacuum assisted hydraulics brake assembly with vacuum booster
97	Air brake assembly
98	Brake lining rivetting machine(foot operated)
99	Clutches, different types such as cone type, disc type, diaphragm type etc.
100	Axle, gear boxes steering boxes fount axle assembly independent front wheel spring assembly
101	Full floating axle and semi floating axle assembly
102	Steering assembly – rack and pinion type
103	Steering assembly- power steering
104	Spring tension scale- 0-4.5 kg
105	Valve spring compressor
106	Carburettor repair tool kit
107	Puller set steering wheel universal
108	Puller set universal bearing and bushes
109	Lifting jack, screw type-
110	Coil spring compressor for suspension spring
111	Hot patch clomp

112	Piston ring compressor
113	Valve key inserter
114	Wall charts(driving instructions)
115	Connecting road alignment fixture
116	Valve refacer
117	Piston ring expander
118	High rate discharge tester
119	A.V.O meter
120	Pneumatic tools
121	Impact screw driver
122	General purpose puller
123	Stud extractor
124	Spring plier 150, 200,mm
125	Torque wrench (set of three)nos.
126	Growler
127	Battery charger
128	Timing light
129	Hydrometer
130	Continuity meter
131	Tyre changer

General machinery:-

1.	Grinder with two :7” wheels with twist drill grinding attachment
2 .	Arbor press hand operated ½ ton
3.	Motor vehicle in running condition (diesel heavy)
4.	Motor car in running condition(petrol)
5.	Light commercial vehicle- old 3 ton
6.	Heavy commercial vehicle
7.	Petrol engine (running condition,car type)
8.	Diesel the running type condition
9.	Petrol engine(2 strokes) motor cycle/ scooter
10.	Spark plug cleaning and testing equipment
11.	Air compressor- 2 stage- 500 litre with 5 hp motor and air receiver
12.	Mechanical hoist/ plate form type

Subject Code : 30640011**Machine Drawing and CAD - 1st Year**

Theory	Practical
<p>1 Introduction of Drawing Use of different drawing instruments, equipments & Drafting Techniques, Types of letters, conventions of line, Scales; plane scale and diagonal scales.</p> <p>2 Curves & Tangential Exercises To draw an ellipse by 1. Arcs of circle method 2. Concentric circle Method 3. Rectangle / oblong method; To draw a parabola by 1. Director focus method 2. Rectangle method; To draw hyperbola 1. Transverse axis and focus Method 2. Passing Through a given point; To draw an Involute of 1. A polygon (up to Hexagon) 2. A circle. To draw a cycloid, epicycloid & hypocycloid.</p> <p>3 Orthographic Projections Introduction to orthographic projections, first and third angle Method of projection, conversion of simple pictorial view into Orthographic view Dimensioning technique</p> <p>4 Sectional Views Conversion of given pictorial view into sectional orthographic views.</p> <p>5 Orthographic Views Isometric scale and views of simple objects; isometric views of Rectangular, cylindrical objects and Representations of slots on Sloping faces.</p> <p>6 Projections of Lines Projections of solids- prism, cone, cylinder, Tetrahedron; axis Inclined to one reference plane only.</p> <p>7 Section of Solids Sections of the solids-prism, pyramid, cone, cylinder, Solids resting on their bases on the Ground Section plane is inclined to one Reference plane and perpendicular to other</p>	<p>1. Practice: Layout of drawing sheet Types of lines – Thickness, shade of lines and its General applications. Practice: Draw type of lines as per IS-70714-1983 Type of Angle, Triangles and their types. Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement and indication of dimensions. Place dimensions in the drawing by aligned system and unidirectional system, Give dimension to the given drawing by following dimensioning principles as per BIS Method of dimension common features. Geometrical construction using drawing instruments-Lines, Angles, patterns, Circle, Arc, Tangents, Triangles, Quadrilaterals, Regular Polygons. Different type of Tapers, Related Exercise on this topic.</p> <p>1. Practice: Construct square, rectangle, parallelogram, rhombus, trapezium and quadrilateral</p> <p>2. Practice: Draw a regular pentagon by circum scribing & inscribing</p> <p>3. Practice: Draw a regular hexagon by arc method</p> <p>4. Practice: Draw a regular pentagon, octagon and various types of tapers</p> <p>5. Free hand sketching of straight lines, rectangular, circles, squares, Polygons, ellipse.</p> <p>6. Practice: Prepare proportionate free hand sketches of plane figures</p> <p>7. Practice: Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand. Orthographic projection I and III angle – Simple machine elements, Procedure for preparing a scale drawing.</p> <p>8. Practice: Draw a plan, elevation and side view of prism and cylinder, cone and pyramids</p> <p>9. Practice: Draw 1st angle and 3rd angle projection (i) Front View (ii) Top view and (iii) side view of object having stepped blocks with curved surfaces – simple machine elements. Drawing Isometric views out of orthographic views – Simple Machine Elements</p> <p>10. Practice: Construct an isometric scales to a given length</p>

<p>8. Conventional Representation Introduction; Conventional Representation of Material; Conventional breaks, Machine components such as splined shaft; bearings, slotted heads, raced & pinion, Internal & External Threading, Springs, Gears, Pipe fitting & pipe joint, Welded joint; Practice Drawing of all type of Conventions in the sketch book.</p> <p>9 .Limit Fits & Tolerances Process Tolerance, Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing, Introduction of dimensional; Tolerances Element of Interchangeable system, Tolerance; Fundamental tolerance, Calculation of limit size, Method of specifying dimensions of fit, limit & Tolerance, Geometrical Tolerance, form tolerance, Position Tolerance, Indication of Geometrical Tolerance; types of geometrical Tolerance.</p>	<p>11. Practice: Draw the isometric projection of cube, hexagonal prism, cylinder and cone</p> <p>12. Practice: Draw the isometric view of the objects/blocks/solids with curved surfaces Missing lines and views.</p> <p>13. Practice: Visualize the shape of the object from the given two views and add the third views – simple machine elements</p> <p>14. Practice: Identify the lines missed in multi views and supply them. Identify at least five shapes satisfying a given view. One problem on each projection of lines and plane are to be drawn in A-3 size sketch book.</p> <p>15. Identify the third view for the given two views of similar in shapes and size. Development of regular objects bounded by plane surfaces-cube, prisms, cylinder and cones.</p> <p>16. Practice: Draw the development of surfaces of a cube and prism</p> <p>17. Practice: Draw the development of surfaces of a cylinder and cones Explanations of full – sectional view, half-sectional view, aligned sections.</p>
<p>10. Production Drawing Introduction, need, scope; Production drawing procedure,</p> <p>Production drawing for, Nut & Bolt, Spur gear, Fly – cotter joint Wheel, V belt pulley.</p>	<p>18. Practice: Draw full and half sectional view of simple machine elements. Conventions and symbols used in drawing, Abbreviations used in engineering drawing, surface finish symbols, Welding symbols and Annotations.</p> <p>19. Practice: Draw surface finish symbols, Welding symbols and Annotations. Machining symbol, Induction of machining Symbol, Indication of surface roughness characteristics, symbol for direction of lay; Induction of machine allowance, position of Specification of surface roughness, Indication of drawing, Blue print reading of various Engineering drawing and Machine drawing.</p> <p>20. Practice: Blue print reading of Engineering Drawings and Machine drawing. Introduction to free hand sketching of machine parts. Tracing and printing of drawing. Introduction to Auto CAD, 3D modeling concept.</p> <p>21. Practice: Draw the elevation, plan and the side view of Nut & Bolt, Spur gear, and Fly cotter joint Wheel, V belt pulley.</p>

Machine Drawing and CAD – 2nd Year

Theory	Practical
A] Computer Fundamental	
1] Fundamentals Of Computer Introduction Components of PC The system Unit Front part of system Unit Back part of system Unit CPU Memory of computer Monitor Mouse, Keyboard Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	1. Working with Windows 2000 desktop ,start icon, taskbar, Recycle Bin, My Computer icon ,The Recycle Bin and deleted files Creating shortcuts on the desktop 2. The Windows 2000 accessories, WordPad – editing an existing document, Use of Paint – drawing tools, The Calculator, Clock 3. The Windows Explorer window, concept of drives, folders and files? Folder selection techniques, Switching drives, Folder creation, Moving or copying files, Renaming, Deleting files ,and folders 4. Printing, Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts, The clipboard and ‘drag and drop’, Basic clipboard concepts Linking vs. embedding,
2] Introduction To Windows 2000/Xp Working with window Desktop Components of window Menu bar option Starting window Getting familiar with desktop Moving from one window to another Reverting windows to its previous size Opening task bar buttons into a windows Creating shortcut of program Quitting windows	5. Moving through a Word document menu bar and drop down menus toolbars 6. Entering text into a Word 2000 document, selection techniques Deleting text 7. Font formatting keyboard shortcuts 8. Paragraph formatting Bullets and numbering 9. Page formatting What is page formatting? Page margins Page size and orientation Page breaks, Headers and footers 10. Introducing tables and columns
3] GUI Based Editing, Spreadsheets, Tables & Presentation Application Using MS Office 2000 & Open Office.Org Menus Opening, menus, Toolbars, standard toolbars, formatting toolbars & closing Quitting Document , Editing & designing your document Spreadsheets Working & Manipulating data with Excel Changing the layout Working with simple graphs Presentation Working With PowerPoint and Presentation	11. Printing within Word 2000 Print setup Printing options Print preview 12. Development of application using mail merge Mail merging addresses for envelopes Printing an addressed envelope and letter 13. Creating and using macros in a document 14. Creating and opening workbooks Entering data 15. Navigating in the worksheet Selecting items within Excel 2000 Inserting and deleting cells, rows and column Moving between worksheets, saving worksheet, workbook

<p>4] Introduction To Internet What is Internet Equipment Required for Internet connection Sending &receiving Emails Browsing the WWW Creating own Email Account Internet chatting</p>	<p>16. Formatting and customizing data 17. Formulas, functions and named ranges 18. Creating, manipulating & changing the chart type 19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet 20. * Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation</p>
<p>5] Usage of Computer System in various Domains Computer application in Offices, books publication data analysis ,accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.</p>	<p>21. Using the AutoContent wizard ,Starting the AutoContent wizard, Selecting a presentation type within the AutoContent wizard Presentation type Presentation titles, footers and slide number 22. Creating a simple text slide, Selecting a slide layout Manipulating slide information within normal and outline view, Formatting and proofing text, Pictures and backgrounds, drawing toolbar, AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter</p>
	<p>23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slide show timings. Animation effects 24. Microsoft Internet Explorer 5 & the Internet Connecting to the Internet The Internet Explorer program window, The on-line web tutorial Using hyper links, Responding to an email link on a web page 25. Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet using Web Crawler, Searching the Internet using Yahoo, Commonly used search engines</p>
<p>6] Information technology for benefits of community Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology</p>	<p>26. Favorites, security & customizing Explorer Organizing Favorite web sites Customizing options – general, security, contents, connection, programs, advanced 27. * Using the Address Book Adding a new contact, Creating a mailing group, Addressing a message, Finding an e-mail address 28. Using electronic mail, Starting Outlook Express, Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying</p>

	<p>29. Email & newsgroups, Creating and sending emails Attached files, Receiving emails, Locating and subscribing to newsgroups, Posting a message to a newsgroup</p> <p>30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar</p>
<p>Minimum system requirement for AutoCAD</p> <p>Starting AutoCAD – Use a Wizard, Use a Template, Start from Scratch, Open a Drawing, Quick Setup method, Advanced Setup method, Types of Units, AutoCAD Window Details – Menus, Toolbars, Command line area, Drawing area, WCS icon etc, Use of Function keys,</p> <p>Modes in AutoCAD – Snap, Grid, Ortho, Osnap, Polar, Otrack, Model</p> <p>Using various Toolbars, Creating new drawing, Saving a drawing, Closing a drawing, Opening a drawing, Use of mouse in AutoCAD, Use of Keyboard,</p> <p>Coordinate system – Types of Coordinate, Absolute, relative, polar coordinate</p> <p>Draw commands – Line, Ray, Construction line, Spline, rectangle, Polygon, circle, ellipse, Arc, Donut, Polyline, Multiline, Multiline Style, Point, Point Style, Divide, measure</p> <p>Zoom commands – Real-time zoom, pan real-time, zoom window, zoom all, zoom in, zoom out, zoom center, zoom dynamic. Zoom scale, zoom previous.</p>	<p>Practical related Creating New file, Closing Drawing, Saving Drawing, Startup Methods, Modes in AutoCAD, Use of Function Keys, Use of Keyboard and Mouse in AutoCAD Practice. CAD Command Practice on small objects</p>
<p>Object Snapping – Dialog box, Toolbar, Tracking, snap p from, end point, mid point, center, intersection, apparent intersection, insertion, quadrant, tangent, perpendicular, node etc.</p> <p>Editing commands – Setting drawing limit, setting units, drawing area parameter, Copy, move, erases, opps, scale, rotate, stretch, lengthen, break, trim, extend, chamfer, fillet, mirror, offset, align, explode, array – rectangular & polar, editing using grips, edit Polly line, edit multiline, using property dialog box., Match property, using single line text, using multiline text, editing text, creating text style.</p>	<p>Practice on Small Drawing Objects using Commands in</p> <p>Draw Menu Practice of Editing command on above drawing objects, Dimensioning Drawing</p> <p>Creating Title block, Creating Part List, Material List using Text in AutoCAD,</p> <p>Drawing Plan, Elevation, Section, in AutoCAD for various mechanical objects, machine part etc.</p>

<p>Dimensioning technique – Linear, Aligned, Radius, Diameter, Angular, Baseline, Continuous, Leader, Center mark, creating dimensioning style.</p> <p>Block, Wblock, Attribute.</p> <p>Hatch, Boundary, Region.</p> <p>Object property toolbar – layer control, color control, Line type control, line weight control, working with layers, (freeze, thaw, lock, unlock, plot etc.)</p> <p>Printing and using scale in the drawing.</p>	
<p>Viewing Orthographic projections, Viewing Isometric projections, Plan View, Aerial View Window, Using Named Views, Using multiple Tiled View ports – New view ports, Polygonal View ports, object viewports, named view ports, joining viewports, Floating viewports in paper space, Region, Redraw, Regen all command. Shading the model – 2D wireframe, 3D wireframe, Flat shaded, Gauged shaded, hidden view Region, Redraw, Regen all command.</p> <p>Interacting Viewing in 3D – 3D orbit command, panning, zooming, adjusting the view, Adjusting the camera distance, swiveling the camera, Continuous orbit, using Visual aids – Compass, Grid, UCS icon etc Concept of Wire frame modeling, Surface modeling, Solid modeling, Concept of Thickness & Elevation</p>	<p>Suitable CAD Practical (Command Practice) based on the Theory.</p> <p>Creating Simple 3D Model of Machine assemblies required 3D view from all sides.</p> <p>Practice of using AutoCAD Mechanical Desktop package for creating various 3D Machine Elements.</p>
<p>Surface modeling – Ruled surface, Edge surface, Revolve surface, Tabulated surface, 2D solid, 3D face, Using Predefined 3D surface objects – Box, pyramid, Wedge, dome, sphere, cone, tours, dish, mesh.</p> <p>Solid modeling – Extruding solid, Revolving solid, Slicing & Interfering solid, using predefined 3D solid objects - Box, pyramid, Wedge, Cylinder, Cone, Torus Modifying 3D Solid object – 3D array, 3D mirror, 3D Rotate, Trim, Extend, Fillet, Chamfer etc.</p> <p>Boolean operation – Union, Subtract, intersect.</p>	<p>Creating, Rendering, and Viewing Various Machine parts and assemblies Elements like different types of Screws, bolt, nut, nail, rivet, keys, cotter, locking devices, stud, plates, angle, channel, sockets, cover, packings, gasket, belt, wheels, gear, grooved parts, casting, supports base plates, pipe joints, I section joints etc.</p>

<p>Solid Editing – Extrude face, move face, offset face, delete face, rotate face, taper face, color face, copy face, color edge, copy edge, imprinting the object, Cleaning, separating objects, shelling the solid Checking validity of solid object.</p> <p>Rendering 3D solid – Rendering options / Rendering procedure – query, crop window, skip dialog box method, Rendering, using light effects in rendering – Distance light, point light, spot light, using Sun angle calculator for shaded model, modifying lights parameter, using lights in scene.</p> <p>Applying material effect to solid object. Using material library. Mapping background. Using background images Printing the 3D rendered view / drawing.</p>	<p>Creating, Rendering, Viewing, Generating JPEG images for Complete assembly model, Printing Photo with various View of machine assemblies,</p> <p>Creating Slide show presentation of such views of assembly model including All four side view, 3D view from four corner, Isometric View, Perspective View etc.</p> <p>Introduction to 3DS Max Software Package for animation Purpose.</p> <p>Introduction to Pro-Engineer, CATIA Software.</p>
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List of Books

Machine Drawing

- 1] N.D.Bhatt Elements of Engineering Drawing 49TH 2005 Charotar publishing house, opposite Amul dairy, court road Anand India
- 2] N.D.Bhatt Machine Drawing 40TH 2005 Charotar publishing house, opposite Amul dairy, court Road Anand India

Computer Fundamental

- 1] Vikas Gupta Comdex Computer Course Kit First Dreamtech
- 2] Henry Lucas Information Technology for management 7Th Tata Mc-Graw Hills
- 3] B.Ram Computer Fundamentals Architecture and Organisation Revised 3rd New Age International Publisher

CAD Books

- 1] Reference Manual of AutoCAD AutoDesk
- 2] Reference Manual of Felix cad Felix CAD
- 3] Reference Manual of Intel CAD
- 4] Reference Manual of Auto Civil
- 5] Reference Manual of 3D-Max

List of Tools and Equipment

A] General Class room

Sr	Name of Item	No.
1	Steel lockers 8 compartments with individual lockers (1980 x 910 x 480 mm)	4
2	Chair with writing pad	25
3	Steel almari with self 6.5' x 3' (18 gauge)	2
4	Steel table 4' x 3'	2
5	Teacher chair	2

B] For Computer Fundamental and CAD Practical

Sr	Name of Item	No.
1	Computer System P4 with accessories Complete with license OS. Compatible for- to run AutoCAD 2010 and Windows 7 OS.	5+1
2	Plotter- HP Design Jet 500 latest model	1
3	Scanner	1
4	Computer table	5+2
5	Chair for computer	10+2
6	Laser Printer	1
7	AutoCAD 2010 or above Software	1
8	M. S. Office Software	1
9	Pro- Engineering –V-4 Student Version	1
10	CATIA R-17 – Evolution Student Version	1

Subject Code : 30640001

Subject Name - Mechanical Technology and Material Science - 1st Year

Theory	Practical
1] Fundamental of material <input type="checkbox"/> Introduction of metals and non metals <input type="checkbox"/> Structure of metal <input type="checkbox"/> Formation of grain <input type="checkbox"/> Imperfection in crystals <input type="checkbox"/> Deformation in metal and change in properties <input type="checkbox"/> Fracture <input type="checkbox"/> Equilibrium diagram <input type="checkbox"/> Iron, carbon equilibrium diagram <input type="checkbox"/> Time temperature transformation diagrams	1. Take the tensile test of M.S. specimen & Draw stress strain diagram, yield pts.
2 Ferrous metals and alloys <input type="checkbox"/> Pig iron and cast iron <input type="checkbox"/> Effect of chemical elements on iron <input type="checkbox"/> Classification of steel and its application <input type="checkbox"/> Alloy steel and special alloy steel 3 Non Ferrous metals and alloys Introduction to non ferrous alloys <input type="checkbox"/> Aluminum and its alloys <input type="checkbox"/> Copper and its alloys <input type="checkbox"/> Lead and its alloys <input type="checkbox"/> Nickel and its alloys <input type="checkbox"/> Alloys for high temperature service <input type="checkbox"/> Metal for nuclear energy 4 Crystal Structures <input type="checkbox"/> Fundamental concept <input type="checkbox"/> Unit Cells <input type="checkbox"/> Metallic crystal structures <input type="checkbox"/> FCC Structure <input type="checkbox"/> BCC Structure <input type="checkbox"/> HCP Structure <input type="checkbox"/> Weld ability 5 Properties of Metal <input type="checkbox"/> Mechanical properties of Metal Elasticity, ductility, malleability, brittleness, Toughness, Stress strain behavior, Elastic limit, hooks Law, UTS, poisons ratio, factor of safety, hardness and hardness tests shear strength, resistance.	2. Study the mechanical properties like Elasticity, ductility, malleability, Brittleness, toughness of Different materials – M.S., C.S. Bronze, Copper, Aluminum Study the Hardness test <input type="checkbox"/> Brinnel Hardness test <input type="checkbox"/> Rockwell hardness test

<p><input type="checkbox"/> Electrical properties of Metal Electrical conductivity, resistivity, electrical Characteristic of commercial alloys</p> <p><input type="checkbox"/> Thermal properties of metal Heat capacity, thermal expansion, thermal Conductivity, thermal stress</p>	
<p>6 <input type="checkbox"/> Magnetic Properties of metal Basic concepts, diamagnetism and Para magnetism, ferromagnetism, influence of temperature on magnetic behavior, domain and hysteresis, soft and hard magnetic material.</p> <p>7 Heat Treatment of material <input type="checkbox"/> Normalizing <input type="checkbox"/> Hardening <input type="checkbox"/> Quenching and tempering <input type="checkbox"/> Annealing <input type="checkbox"/> Stress Relieving <input type="checkbox"/> Case carburizing and case hardening. <input type="checkbox"/> Toughening Weld ability of Metal definition and concept Effect of alloying elements on weld ability Purpose and types of weld ability tests</p>	<p>3. Study the Electrical Properties of some conductors (conductivity, Resistivity) Aluminum, Copper, Brass, Tungsten</p>
<p>8 Cracking phenomena in steel <input type="checkbox"/> Cold crack due to hydrogen <input type="checkbox"/> Hydrogen cracking <input type="checkbox"/> Measurement and control of hydrogen in the deposited weld metal <input type="checkbox"/> Cracking mechanism in the weld metal and HAZ <input type="checkbox"/> Weld decay <input type="checkbox"/> Lamellar tearing <input type="checkbox"/> Hot cracking <input type="checkbox"/> Reheat cracking</p>	<p>4. Study the effect on materials with heat treatment Normalizing, Hardening, Quenching & Tempering Anne ling, Stress Reliving, Case Hardening, Toughing For Different Material's M.S., C.S., Nickel, Capper</p>

Subject Name - Mechanical Technology and Material Science - 2nd Year

Theory	Practical
<p>1. Bench work and fitting Introduction- Vices – Hammers- Chisels- Chipping- Files- Filing- Scraper- Scraping-Grinding and Polishing- Hacksaw sawing- Marking tools – Surface plate- Scriber – Punch- V block- Angle plate- Try square –Marking out –Drill- Drilling- Reamer- Reaming- Taps- Tap drill size- Tapping – Dies and stock- Dieing.</p> <p>2. Sheet Metal Work Introduction – Metal used in sheet metal work-Sheet metal hand tools- Sheet metal operation-Sheet metal joint- Hems and Sems – Sheet metal allowance- Sheet Metal working machine-Laying out a pattern</p> <p>3. Plumbing, Threading, Fasteners & joints Plumbing- Specifications of pipes- Material used for pipes-Pipe fitting & Joints-Taps & valves –Plumber tools – Threaded fasteners- screw threads and their uses- Indian standard threads-Cap screw and machine screw-Set screw- Methods of producing screw threads- Bolts- Studs- Forms of nuts- Riveting joints.</p> <p>4. Smithy and Forging Maintenance and application of smith health-Anvil- Swage block-Tongs- Hammer-Flatters-Measuring tools e.g.-Try square- Steel rules-Calipers-Operations e.g. up setting- drawing down- bending setting- forge welding.</p> <p>5. Welding Technology Welding Welding introduction to different welding processes, like gas Welding, ARC welding TIG, MIG, submerged arc welding, spot Welding, electrodes etc. Brazing methods & application, Knowledge of welding skills.</p>	<p>Fitting</p> <ol style="list-style-type: none"> 1. Filing Flat surfaces: Checking flatness and square ness using a try square – Types of filing – Cleaning files. 2. Chipping: Hints on chipping 3. Hack sawing: Selection of blades for different metal sections - Fix hack sawing the material for the job blades maintaining. Correct tension and direction – Hack sawing. Filing ‘V groove and complex profile by file & check with profile gauge. 4. Filing radius –check with radius gauge 5. Check profile with profile gauges. 6. Drill plate, Drilling, counter sinking, counter boring. Operations on job 7. Drilling and Tapping: Internal threading of holes by using hand taps – determine the tap drill size, drilling, counter- sinking and tapping – precautions with tapping a blind hole. 8. External thread cutting using die.

<p>6. Metal Turning (Lathe)</p> <p>6.1 Function of lathe, Types of lathe, the size of lathe, Descriptions & function of lathe parts,</p> <p>6.2 Lathe accessories and attachments.</p> <p>6.3 Operation on Lathe</p> <p>6.4 Cutting Tools, Classification , Influence of tool angles.</p> <p>6.5 Types of tools, cutting speed, Feed, Depth of cut,</p> <p>6.6 Machining time. Cutting tool signature.</p>	
<p>7. DRILLING</p> <p>Introduction Types of drilling machine, Portable drilling machine, Sensitive drilling machine. Upright drilling machine, Radial Drilling Machine; Gang drilling machine, Multiple spindle drilling machine Automatic drilling machine, Deep hole drilling machine; The size of a drilling machine, Upright drilling machine parts. Radial drilling machine parts, Work holding devices, Tool holding devices, Drilling machine operation, Drilling machine tools.</p> <p>Twist drill nomenclature. Drill size Designation of drill material Reamer, reamer nomenclatures. Counter bore, Countersinks and spot face, Taps. Tap nomenclatures. Cutting speed Feed, Depth of cut, Machining time in drilling</p>	<p>Basic Workshop Practice</p> <ol style="list-style-type: none"> 1. Step turning and Radius forming: Free hand form turning – by using form tool. 2. Drilling and Boring-Use of inside caliper and outside Micrometer for bore measurement. 3. Drilling and reaming: by hand-Method of checking the bore With a plug gauge. 4. Drilling and step Boring: Boring blind hole with a boring tool.
<p>8. SHAPER</p> <p>Introduction. Types of shapers. Principal parts. Shaper size; Shaper mechanism; Work holding devices. Shaper operations. Shaper tools; Cutting speed, feed and depth of cut; Machining time.</p> <p>9. SLOTTING</p> <p>Introduction. Types of slotting machine; Slotter size; Slotting machine parts; Work holding devices; Slotter operation; Slotter tools; Cutting speed, feed and depth of cut.</p>	<ol style="list-style-type: none"> 5. Drilling, Boring and Recessing: Internal recessing to a size broader than the width tool – Form a recess. 6. Shaping blind & open keyways on shaping machine 7. Shaping irregular surfaces.(Concave / Convex)

10. Powder Metallurgy Introduction- Process Description- Manufacture of metal powder- Blending of powders- competing profiteering- Sintering-Secondary operation –ISO Static pressing –Product of powder metallurgy- Advantages of process –Disadvantages and limitation-Design considerations Introduction to CNC	8. Slotting internal grooves on slotting machine 9. Welding Practical-fusion run with/without filler rod on MS Sheet – squire butt joint on MS sheet LAP,T& Edge joint on M.S. Sheet
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List of Books –

1. M. N. Uppal A Text - book of ngineering Chemistry
2. V. P. Mehta A Text - book of polytechnic Chemistry
3. Banswal, Mahajan and Mehta A Text - book of,Applied Chemistry
4. Hazra Choudhary Elements,of workshop technology
5. S.K.Hajra Choudhary Elements of workshop technology Vol-I First 1964 Media promoters & Publisher pvt. Ltd.
6. Mahajan Mechanical Technology Third 1989 Vrinda publication

List of Equipments / Machinery :

Sr. No.	Name of the Equipment/ Machinery	Nos.
1	TRAINEES TOOL KIT	5
2	Try Square 10 cm Blade	5
3	Calipers outside 15 cm spring	5
4	Caliper inside 15 cm spring	5
5	Dividers 15 cm Spring	5
6	Calipers 15 cm Hermaphrodite	5
7	Scriber 15 cm	5
8	Punch center 10 cm	5
9	Screw driver 15 cm	5
10	Chisel cold 20 cm	5
11	Trammel 30 cm	5
12	Hammer ball peen 0.5 kg with handle	5
13	Hammer Mallet	5
14	Hammer Plastic	5
15	Hammer ball peen 0.5 kg with handle	5
16	File flat 25 cm second cut	5
17	File flat 25 cm second cut	5
18	Hacksaw frame adjustable 20-30 cm	5
19	Dot slot punch	5
20	Steel rule 15 cm English and metric	5
21	Steel rule 30 cm English and metric	5
22	Try square 20 cm Blade	5
23	Steel tool box	5
24	Scriber	5
25	Lock and keys	5
26	Combination plier	5
27	Jenny calipers	5
28	Aluminum tray 15 cm X 10 cm	5
29	Fellow polish cloth standard size	5
	Shop Outfit & Measuring Instruments	
30	Straight edge 45 cm X 45 cm	1
31	Marking table 90X90 cm	1
32	Surface plate 45 cm X 45 cm	1
33	Vee Block pair 7 cm and 15 cm with clamps	1
34	Angle plate 10 X 20cm	1
35	Number Punch 3 mm set	2
36	letter Punch 3 mm set	2
37	Round punch 3 mm X 4 mm set of 2	2
38	File flat 20 cm bastard	2
39	Oil Stone 15 X 5 cm X 2.5 cm	
40	Spanner adjustable 10 cm	1
41	Chisel cold 20 cm cross cut	2

42	Chisel 10 cm flat	2
43	Drill twist 1.5 mm to 15mm (various sizes) by 0.5	2
44	Files assorted sizes and type including safe edge	10
45	Micrometer inside 50-150 mm with screen	2
46	Bench Vice 12 cm jaw	5
47	Work Bench 240 X 120 60 mm with screen	3
48	Drill point angle gauge	1
49	Vernier Calipers 20 cm	2
50	Vernier height gauge 30 cm	1
51	Huntington and diamond dresser	1
52	Taps and dies complete set (metric)	2 set
53	Hacksaw frame	5
54	Fire buckets with stand	1
55	Thread pitch gauge metric, BSX, BSF, MC, MF & SAE	1 each
56	D.E. spanner ser of 12 metric 6 mm to 32 mm	1 set
57	Ring spanner set at 12 metric 6 mm to 32	1 set
58	Stud extractor set of 3	1 set
59	Universal puller for removing pulleys, bearings	1 set
60	Unserviceable engine/gear box rear axle	1
61	Stud remover with socket handle	1
62	Combination pliers 15 cm	5
63	Depth guage (inch and metric	1
64	Screw pinch gauge (inch and metric)	1 set
65	Feeler gauge 20 blades (inch and metric)	1
66	Aluminum tray 45 X 30 mm	5
67	Oil can 0.5 liter capacity	1
68	Surface gauge	1
69	Cylinder bore gauge (mercier)	1
70	Telescopic gauge	1
71	Steel measuring tape 10 meter in a case	2
72	Sets of Morse socket MT 0-1,1-2,and 2-3	1 set
73	Blow lamp	1
74	Torque wrenches 5-35 Nm,12-68 Nm&50-225 Nm.	1 each
75	Outside micrometer English 0-1,1-2,2-3,3-4,4-5,And 5-6 inches	1 each
76	Micrometer outside 1 to 25 mm,25mmto 50mm ,50 to75 mm,75 to100mm,100 to 125mm,125 to 150mm.	1
77	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	1
78	Printed wall chart framed for display showing measuring instruments.	10
79	Inside micrometer English 2" to 6" with extension road	1
80	Vernier bevel protractor (metric and inch)	1
81	Vernier calipers (inch and metric) 6"x12"	1
82	Vernier micrometers(inch and metric)	1
83	Vernier height gauge 150 mm height (inch and metric)	1
84	Dial micrometer (inch and metric)	1
85	Small bore gauge (standard)	1
86	Dial test indicator to read (inch an metric)0.02mm	1

	General Installatoin /Machineries	
87	Radial Drilling Machine 25mm capacity	1
88	Power Hacksaw	1
89	Rotary Cut off Machine	1
90	Shaping machine	1
91	Hydraulic Press 2 ton capacity	1
92	Surface plate (small)	1
93	Surface plate (big)	1
94	Standard Arc Welding machine	1
95	Horizontal milling machine	1
96	Bench Drilling machine 6-12mm cap Motorized with chuck and key	1
97	Grinding machine (general purpose)D.E. pedestal with 300mm dia wheels rough and smooth	1
98	Hydraulic Trainer with Power pack	1
99	Pneumatic Trainer	1
	Workshop Furniture	
100	Suitable Work Tables with vices As required	1
101	Stools 25 Nos	25
102	Tool Cabinet 2 nos	2
103	Trainees locker 2 nos	2
104	Fire fighting equipment , first aid box etc As required	1
105	Book shelf (glass panel) 1 nos	1
106	Storage Rack As required	2
107	Storage shelf As required	2