

Out line Structure ( Skeleton ) of Syllabus.

ZOOLOGY

( With effect from June, 1992. )

F. Y. B. Sc.

PAPER

SECTION

NAME OR TITLE

I

I

Nonchordates I and Chordates I.

II

Parasitology.

II

I

Cell Biology.

II

Genetics.

III

Practs Based on Paper I & II.

S. Y. B. Sc.

I

I

Nonchordates II & Chordates II.

II

Environmental Biology.

II

I

Histology

III

II

Mammalian Physiology.

Practs Based on Paper I & II.

T. Y. B. Sc.

I

I

Nonchordates III.

II

Nonchordates III.

II

I

Chordates III.

II

Chordates III.

III

I

General Physiology.

II

Endocrinology.

IV

I

Biochemistry.

II

Mol. Biology & Genetics.

V

I

Developmental Biology.

II

Microtechnique.

VI

I

Inland Fisheries or Gen. Pathology or  
Agricultural Pest & Their Control or  
Biotechnology or Economic Zoology.

II

Apiculture or Sericulture or  
Public health & Hygiene or  
Drosophila Genetics or Organic  
Evolution & Palaeontology.

VII

Practs Based on Papers I & IV.

VIII

Practs Based on Papers II & V.

IX

Practs Based on Papers III & VI.

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( With effect from June, 1992)

DETAILED SYLLABUS  
ZOOLOGY

(Periods)

F.Y.B.Sc.

PAPER I, SECTION I.

NONCHORDATES I & CHORDATES I.

- I Study of Cockroach with reference to the following :-
- |  |                          |               |    |
|--|--------------------------|---------------|----|
| 1) Systematic position   | 2) Habitat               | 3) Life cycle | 2  |
| 4) Ext. Characters   | 5) Internal organisation |               | 2. |
| 6) Function anatomy-a) Locomotion  |                          |               | 1. |
| b) Digestive system : Food and Feeding habits of nutrition   |                          |               | 3. |
| c) Respiratory system : Source of oxygen, spiracles. tracheal system and mechanism.  |                          |               | 2. |
| d) Circulatory system : Haemocoel, Haemolymph, Sinuses, Heart, Segmental vessels, Dorsal diaphragm, Alary muscles, Pericardial cells & mechanism of circulation of haemolymph. |                          |               | 3  |
| e) Excretory System : Malpighian tubules - structure and role, urate cells and moulting.   |                          |               | 2. |
| f) Nervous System - Central, Visceral & peripheral   |                          |               | 2. |
| g) Sense organs : Chemoreceptors, Mechanoreceptors, Auditory and photoreceptors.   |                          |               | 2. |
| h) Reproductive System : Sexual dimorphism, Male and Female reproductive organs, mating, ootheca, Developmental stages nymph and imago,  |                          |               | 3  |

Total (22)

- II Study of Amphioxus with reference to the following :-
- |   |            |                     |    |
|---|------------|---------------------|----|
| 1) Systematic position  | 2) Habitat | 3) Ext. Characters, | 1. |
| 4) Internal organisation  |            |                     |    |
| 5) Functional anatomy :   |            |                     | 1. |
| a) Locomotion, b) Digestive System, c) Respiratory System,  |            |                     |    |
| d) Circulatory system, e) Excretory system, f) Nervous system, g) Sense organs, h) Reproductive system. |            |                     | 9. |
| 6) Embryology.  |            |                     | 2  |

Total (13)

GRAND TOTAL (35)

(35)

PAPER I, SECTION II : PARASITOLOGY

- I Introduction to Parasitism :
- (1) Animal associations : (a) Intra-specific (b) Inter specific-  
i) Commensalism, ii) Mutualism, iii) Parasitism.
  - (2) Definition of Parasitism. (3) Types of Parasites.
  - (4) Types of Hosts.

II Study of the following parasites with reference to the aspects (Periods) below : i) External morphology of various stages in the life cycle, ii) Life cycle, iii) Occurrence - various hosts, iv) Classification v) Transmission Vi) Effect of host vii) Parasitic adaptations viii) Prevention and control ix) Treatment of parasitic diseases :-

- 1) Ehtamoeba histolytica - Parasitic species in man.
- 2) Plasmodium vivax - Parasitic species in man.
- 3) Easciola hepaticae.
- 4) Taenia solium - Parasitic species in man.
- 5) Wuchereria bancrofti.
- 6) Ascaris lumbricoides.
- 7) Human louse
- 8) Sacculina.

III Biological importance of the following parasites with reference to their hosts, pathological effect (if any) and vector.

- 1) Giardia intestinalis, 2) Trypanosoma ambienee, 3) Opalina,
- 4) Balantidium, 5) Nyctotherus, 6) Monocystis, 7) Schistosomn.
- 8) Trichinella spiralis, 9) Ancylostoma duodenale,
- 10) Bed bug, 11) Mosquito, 12) Leach.

IV Inter-relations between host and parasites :

- 1) Effect of parasite on host, 2) Response of host to parasite,
- 3) Types of vectors 4) Modes of transmission, 5) Specificity of hosts, 6) Adaptations of parasites and hosts.

V Prevention and control of parasites :

- 1) Chemical - Pesticides and Chemo - therapy.
- 2) Biological - a) Radiation of vectors and carriers.  
b) Immuno - therapy.  
c) Genetic measures.

PAPER II, SECTION I. : CELL BIOLOGY

(35)

- A Introduction to cell Biology and its importance 1.
- B Contributions of the following scientists 1.  
Hook, Brown, Schleiden and Schwan, Virchow.
- C. General structure of cells. 3  
C-1 Cell as a structural unit; shape, size.  
C-2 Cell types - Prokaryotic and Eukaryotic  
C-3 General organisation of a Prokaryotic cell as illustrated with the help of E.coli.  
C-4 General Organisation of Eukaryotic cell.  
C-5 Comparision between pro and eukaryotes.
- D Microscopy. 3  
D-1 Units of Microscopic measurement.  
D-2 Working of light and electron microscope.  
D-3 Resolving power and magnifying power.
- E Cell Wall  
E-1 Origin, middle lamella.  
E-2 Types-Primary, Secondary and tertiary.  
E-3 Chemical composition of primary and secondary wall.  
E-4 Ultrastructure of Primary wall.  
E-5 Methods of wall formation - Intususception and apposition  
E-6 Functions.

F	Membrane system.	
	F-1 Membrane as a limiting system.	
	F-2 Evidences for chemical composition.	
	F-3 Molecular Organisation with the help of Danielli Davson model.	
	F-4 Concept of unit membrane.	
	F-5 Functions.	
G	Vascular system.	
	G-1 Endoplasmic Reticulum.	
	i) Organisation; ii) Origin; iii) Types; iv) Functions.	
	G-2 Golgi complex.	
	i) Organisation; ii) Origin; iii) Chemical composition; iv) Functions.	
	G-3 Lysosomes.	
	i) Structure; ii) Origin; iii) Enzymes; iv) Polymorphism; v) Functions.	
	G-4 Ribosomes.	
	i) Occurrence; ii) Types - 70S & 80S; iii) Chemical composition; iv) Structure; v) Functions.	
	H- Plastids.	
	H-1 Schimper's classification.	3
	H-2 Chloroplasts - i) Ultrastructure, ii) Chemical composition, iii) Functions.	
I	Mitochondria.	
	i) Ultrastructure; ii) Chemical composition; iii) Mitochondria as symbionts; iv) Functions.	4
J	Nucleus.	3
	J-1 Shape, size, number, position.	
	J-2 Nuclear membrane and pores - Ultrastructure.	
	J-3 Nucleolus - Organisation, Chemical composition, functions.	
	J-4 Nuclear sap.	
K	Chromosomes.	5
	K-1 Number, size, shape, structure - arm ratio.	
	K-2 General organisation-chromonemata, pellicle, matrix centromere, eu and heterochromatin sat chromosomes, concept of gene.	
	K-3 Types - auto and sex chromosomes.	
	K-4 Giant chromosomes - Salivary gland, chromosome, Balbiani rings and puffs.	

PAPER II, SECTION II : GENETICS. 35

A.	Introduction, Definition.	1
B.	Mendel's Laws of Inheritance.	
	B-1 Phenomenon of Dominance.	
	B-2 Law of segregation of characters & purity of gametes.	
	B-3 Law of independent assortment.	3
C.	Gene-interactions and modified Mendelian ratios -	
	C-1 Incomplete dominance { 1 : 2 : 1 ratio }	}
	C-2 Complementary factor { 9 : 7 ratio }	
	C-3 Recessive epistasis { 9 : 3 : 4 ratio }	
	C-4 Dominant epistasis { 12 : 3 : 1 ratio }	
		4

D.	Lethal genes - concept.	
	D-1 Albinism in corn ( 3 : 0 ratio )	
	D-2 Coat colour in mice ( 2 : 1 ratio )	2
E	Chromosomal basis of heredit and sex determination.	
	E-1 Sutton's hypothesis.	
	E-2 Discovery of sex chromosomes.	
	E-3 Sex linkage and sex determination in <u>Drosophila</u> (White eyed - mutant in <u>Drosophila</u> )	
	E-4 Chromosomal method of sex determination. 1) XY method, ii) XO method, iii) ZW method, iv) Honey-bee method.	6
F	Linkage and crossing over.	
	F-1 Concept.	
	F-2 Coupling Vs. repulation.	
	F-3 Linkage in Maize.	
	F-4 Crossing over-general idea (Theories not expected) Significance of crossing over.	4
G	Multiple alleles.	
	G-1 Concept and characteristics.	
	G-2 Discovery of Blood groups by Carl Landsteiner.	
	G-3 Blood typing.	
	G-4 Blood transfusions.	
	G-5 Inheritance of Blood groups - A, B, O, +Rh.	

PAPER II, SECTION II. : GENETICS CONTD.

G	G-6 Significance of blood typing. a) Transfustioni b) Medical legal applicationdisputed parentage.	
	G-7 Goat colour in Rabbit.	5
H	Non-Mendelian inheritance :	
	Cytóplasmic inheritance.	
	a) Inheritance of Plastids.	
	b) Kappa particles.	
I	Chromosomal aberrations.	
	I-1 Delation.	
	I-2 Duplication.	
	I-3 Inversion.	
	I-4 Translocátion.	2
J	Numerical changes in chrosomes.	
	J-1 Aneuploody.	
	J-2 Euploidy.	
	J-3 Significance, of chromosomal variations.	4
K	Simple examples on the topics E,C,D and G.	2
	Total	35.

PAPER III PRACTS : BASED ON PAPER I & II. (PRACTS)

- I Nonchordates : Cockroach. 9  
(E) 1) Classification, Ext. Characters, Sexual diamorphism.  
(E) 2) Dissection of cockroach so as to study the following sy. Digestive, Nervous, and Reproductive.  
(E) 3) Temporary preparations of the following :- a) Antenna- male and female, b) cornea, c) Mouth parts, D)Wings- Fore and Hind wings, e) leg, f) Spiracles - Thoracic & abdominal. g) Salivary glands, h) Gizzard, i) Trachea, j) Striped muscles, k) Spermatheca, l) Ovariole.  
(D) 4) Observation of permanent slides a) Genitalia - male and female, b) Ootheca - entire, c) Heart & alary muscles.
- II (D) Chordates : Amphioxus. 2  
1) Classification, Ext. morphology.  
2) Study of Int. organisation by obsening cross sections passing through various regions.  
3) Embryology slides.
- III. Parasitology. 5  
(E) 1) Study of rectal parasites from cockroach / frog.  
(D) 2) Study of different types of Animal associations.  
(D) 3) Study of life cycles of the animals mentioned under II of Paper I Section II - Parasitology.
- IV Cell Biology. 3  
(E) 1) Squash preparation of onion root tip.  
(D) 2) Study of different stages of Mitosis.  
(D) 3) Microphotographs or diagrams of cell organelles.
- V. (D) Diagrams Genetics. :- 3  
1) Various steges in life cycle  
2) Dimorphic characters.  
3) Culturing method.  
4) Various mutants.  
5) Giant chromosomes.

TOTAL PRACTS- 22.

Syllabi for the Three-year Integrated B.Sc. Degree Course.  
STATISTICS (Principal) First year B.Sc. (with effect from June, 1992)

Paper I: Descriptive Statistics

Objectives:

The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.

At the end this course students are expected to be able (i) to compute various measures of central tendency, dispersion, skewness and kurtosis. (ii) to compute the correlation coefficient and regression coefficients from ungrouped and grouped bivariate data and interpret them. (iii) to tabulate statistical information given in descriptive form (iv) to analyse data pertaining to attributes and to interpret the results.

Contents:

1. Fundamental concepts.
  - 1.1 Meaning, Scope & Limitations of Statistics.
  - 1.2 Variables - discrete and continuous, Attributes.
  - 1.3 Population, Sample, Raw data, Primary and Secondary data.
2. Frequency distribution.
  - 2.1 Frequency, Cumulative, frequencies, Class, Class-limits, Class boundaries, Class width, mid point.
  - 2.2 Types of classes- exclusive class<sup>s</sup>, inclusive classes, open and classes.
  - 2.3 Formation of ungrouped and grouped frequency distributions from raw data. Cumulative frequency distributions.
  - 2.4 Graphical Representation, Histogram for equal class intervals, Frequency Polygon, Frequency curve. Ogive.
- 3) Measures of central Tendency:
  - 3.1 Concept of central tendency of statistical data, Statistical average, Requirements of a good statistical average.
  - 3.2 Arithmetic Mean (A.M): definition, change of origin and scale, combined Mean of a number of grouped, merits and demerits.
  - 3.3 Geometric Mean (G.M.) : definition, merits and demerits.
  - 3.4 Harmonic Mean (H.M.) : definition, merits and demerits
  - 3.5 Mode: definition, formula for computation (without derivation), graphical method of determination of mode, merits and demerits.
  - 3.6 Definition, formula for computation (without derivation), graphical method of determination of median merits and demerits.

3.7 Quartiles and Deciles. ...2...

3.8 Weighted Means Weighted A.M., G.M., H.M.

3.9 Situation where one kind of average is preferable to others.

3.10 Example and Problems.

4. Measures of Dispersion  
4.1 Concept of dispersion. Requirements of a good measure of dispersion.

4.2 Range, definition, merits and demerits.

4.3 The semi interquartile range (quartile deviation).

4.4 Mean deviation: definition, merits and demerits, minimal property (with proof)

4.5 Mean square deviation: Definition. Variance and standard deviation, definition, merits and demerits, change of origin and scale, combined variance for two groups.

4.6 Absolute and relative measures of dispersion, coefficient of quartile deviation, coefficient of variation.

4.7 Examples and Problems.

5. Moments:

5.1 Raw moments for ungrouped and grouped data.

5.2 Central moments for ungrouped and grouped data. Change of origin and scale.

5.3 Relation between central moments and raw moments.

5.4 Example and Problems.

6. Skewness:

6.1 Concept of skewness of a frequency distribution, positive skewness, negative skewness, symmetric frequency distributions.

6.2 Bowley's coefficient of skewness, Karl Pearson's coefficient of skewness, Measures of skewness based on moments.

6.3 Empirical relation among mean, median, mode.

6.4 Examples and Problems.

7. Kurtosis:

7.1 Concept of kurtosis, Leptokurtic, Mesokurtic and Platykurtic frequency distributions.

7.2 Measures of kurtosis based on moments.

7.3 Examples and Problems.

FIRST TERM END

B. Correlation:

8.1 Bivariate data.

8.2 Concept of correlation between two variables, positive correlation, negative correlation.

8.3 Scatter diagram, conclusion about the type of correlation from scatter diagram.



- 8.4 Covariance between two variables, definition, computation, change of origin and scale.
- 8.5 Karl Pearson's coefficient of correlation ( $r$ ):  
definition, computation for ungrouped and grouped data and interpretation.  
Property (i)  $-1 \leq r \leq 1$ .  
(ii) invariant to change of origin and scale  
(proofs expected.)
- 8.6 Spearman's rank correlation coefficient, definition, computation and interpretation. (with and without ties).
- 8.7 Examples and Problems.
9. Regression:
- 9.1 Lines of regression. Fitting Lines of regression by the Least squares method.
- 9.2 Regression coefficients ( $b_{yx}$ ,  $b_{xy}$ )  
Properties (i)  $B_{yx} b_{xy} = r^2$   
(ii)  $B_{yx} B_{xy} \leq 1$   
(iii)  $B_{yx} = r \frac{b_{yx}}{b_{xx}}$ ,  $b_{xy} = r \frac{b_{xy}}{b_{yy}}$   
(iv) change of origin and scale  
(v) slope of the lines of regression  
(vi) Angle between the two lines of regression.
- 9.3 Explained and unexplained variation, coefficient of determination, Standard error of estimate.
- 9.4 Nonlinear regression second degree and exponential ( $Y=e$ ) curves, fitting of such curves by Least Squares method.
- 9.5 Examples and Problems.
- 10- Theory of Attributes:
- 10.1 Notation, dichotomy, class frequency, order of class, positive class frequency, negative class frequency, contra class frequency, ultimate class frequency, relationships among different class frequency, method of operators (upto three attributes).
- 10.2 Fundamental set of class frequencies: definition, To determine whether a given set frequencies is a fundamental set or not. (upto two attributes.)
- 10.3 Concept of independence and association of two attributes.
- 10.4 Yule's coefficient of association ( $Q$ )
- 10.5 Example and Problems.

Books recommended

1. Croxton F.M. and Cowden D.J. : Applied General Statistics.
2. Gonn, Gupta and Dasgupta: Fundamentals of Statistics, Vol.I
3. Gupta S.P. Statistical Methods.
4. Jon E. Freund. : Modern Elementary Statistics.
5. S.C. Gupta: Fundamentals of Statistics.

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D./

NORTH MAHARASHTRA UNIVERSITY, JALGAON  
PROBABILITY Paper II and Probability

Distributions

Prerequisites: (i) knowledge of sets and set operation such as union, intersection, complementation (ii) De Morgan's Laws of complementation.

Objectives: The main objective of this course is to introduce to the students the basic concepts of probability, axiomatic theory of probability concepts of random variable, Probability distribution (univariate and bivariate) of discrete random variables, expectation and moments of probability distribution, computer fundamentals.

By the end of course students are expected to be able (i) to distinguish between random and non-random experiments (ii) to find the probabilities of events (iii) to obtain a probability distribution of random variable (one or two dimensional) in the given situation and (iv) to apply the standard discrete probability distributions to different situations.

Contents:

1. Sample Space and Events.
  - 1.1 Experiments and Random Experiments. Ideas of deterministic models.
  - 1.2 Definitions of (i) sample space (ii) discrete sample space, finite and countability infinite. (iii) event (iv) elementary event. (v) certain event (vi) impossible event.
  - 1.3 Concept of occurrence of an event.
  - 1.4 Union and intersection of two or more events. Occurrence of (i) at least one of the given events (ii) one of the given events and (iii) all of the given events.
  - 1.5 Mutually exclusive events, complementary events.  
(Denote complement of event.  $A$  by  $A'$ )
  - 1.6 Symbolic representation of given events. Description of events given in symbolic form.
  - 1.7 Examples and Problems.
2. Probability (Over finite sample space).
  - 2.1 Permutation & combination  ${}^n P_r$ ,  ${}^n C_r$ , their simple properties.
  - 2.2 Classical definition of Probability.
  - 2.3 Probability with reference to a finite sample space: Probability assignment approach. Probability of an event.
  - 2.4 Equiprobable sample space, probability of an event.
  - 2.5 Axioms of probability.

- 2.6 Probability of Union of two events  
 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$   
 Statement of extension of this result to union of three events (with proof)
- 2.7 To prove (i)  $P(A) = P(A)$ , (ii) If  $A \subset B$ ,  $P(A) \leq P(B)$
- 2.8 Examples and Problems.
3. Conditional Probability and Independence.  $(A \cap B)$
- 3.1 Definition of independence of two events  $P(A \cap B) = P(A)P(B)$
- 3.2 Pairwise independence and mutual independence for three events.
- 3.3 Definition of conditional probability of an event.
- 3.4 Multiplication theorem:  
 $P(A \cap B) = P(A)P(B|A)$ .
- 3.5 Examples and Problems
- 4.1 Bayes Theorem.
- 4.2 Examples and Problems.
- FIRST TERM END
5. Univariate Discrete Probability distributions.
- 5.1 Definition of discrete random variables.
- 5.2 Probability mass function and (p.m.f.) and (cumulative) distribution function (d.f)  $f(x)$  of a discrete random variable. Properties of d.f.
- 5.3 p.m.f. of a function of a random variable.
- 5.4 Mode and median of a univariate discrete probability distribution.
- 5.5 Examples and Problems.
6. Bivariate Probability distributions:
- 6.1 Definition of two-dimensional discrete random variate, its p.m.f. and d.f.
- 6.2 Computation of probabilities of events in bivariate probability distributions.
- 6.3 Concepts of marginal and conditional probability distributions.
- 6.4 Independence of two discrete random variables.
- 6.5 Distribution of a function or two functions of jointly distributed random variables.
- 6.6 Examples and Problems.
7. Mathematical Expectation.

- 7.1 Definition of expectation of random variable, expectation of a function of a random variable.
- 7.2 Definition of expectation in bivariate distributions.
- 7.3 Theorems on expectation of sum and product of two jointly distribution random variables.
- 7.4 Conditional expectation in bivariate probability distributions.
- 7.5 Definitions of conditional mean and variance of univariate distribution. Effect of change of origin and scale on mean & variance.
- 7.6 Definition of conditional mean and variance in bivariate distribution.
- 7.7 Definitions of covariance and correlation coefficient in bivariate distribution. Does  $R=0$  imply independence of variables?
- 7.8 Definition of raw, central and factorial moments of Univariate probability distributions and their interrelations.
- 7.9 Definitions of raw and central moments of bivariate distribution.
- 7.10 Examples and Problems.
8. Some Standard Discrete Probability Distributions.
- 8.1 Bernoulli Distribution p.m.f. mean, variance, moments, distribution of sum of independent indentially distributed Bernoulli variates.
- 8.2 Uniform discrete distribution on integers 1 to  $n$ ; p.m.f, mean, variance, Situations where this distribution arises. Binomial variate  $X, B(n, p)$
- 8.3 Statement of binomial theorem, Binomial distribution p.m.f.  $b(r, n, p) = \binom{n}{r} p^r (1-p)^{n-r}$  recurrence relation for successive probabilities, computation of probabilities of different events, mode of the distribution, mean, variance, moment & skewness (comment when  $p=0.5$ ,  $p > 0.5$ ,  $p < 0.5$ , recurrence relations for raw and central moments, additive property of binomial variates, distribution of  $X$ , given  $X+Y=n$ , where  $X$  and  $Y$  are independent  $B(n_1, p)$  and  $B(n_2, p)$  variates.
- 8.4 Examples and Problems.

Books Recommended

1. Hoel, P.G. Introduction to Mathematical Statistics.
2. Gupta & Kapoor : Fundamentals of Mathematical Statistics.
3. B.D. Gupta & O.P. Gupta Mathematical Stat.

## PAPER III PRACTICALS.

**Prerequisites:** Knowledge of the topic in the theory papers.  
**Objectives:** At the end of this course, students are expected to be able (i) to compute various measures of central tendency, dispersion skewness and kurtosis. (ii) to compute correlation coefficient, association of attributes (iii) to fit binomial distribution. (iv) to analyse data pertaining to discrete and continuous variables and to interpret the results.

## Title of Experiment.

1. Computation of raw and central moments from ungrouped and grouped data.
2. Computation of measure of central tendency I.
3. Computation of measures of central tendency (II use of an appropriate measure of central tendency. Interpretation of results.)
- A. Computation of measures of dispersion.
5. Computation of measures of skewness and kurtosis.
6. Use of random number tables.
7. Scatter diagram, fitting of Lines of regression and computation of correlation coefficient (ungrouped data)
- B. Computation of Spearman's correlation coefficient.  
 Fitting Lines of regression and computation of correlation
10. Fitting of second degree curves, fitting of exponential curve.
11. Association of attributes.
12. Fitting of binomial distribution.
13. Application of the binomial distribution and computation of probabilities.

**Note:-** Practicals 1 to 6 are to be taken in the first term and 7 to 13 in the second term.

( With effect from June, 1992 )

SYLLABUS FOR F.Y.B.Sc. MICROBIOLOGY

NORTH MAHARASHTRA UNIVERSITY,  
JALGAON.

MICROBIOLOGY PAPER-I

Term -I

- UNIT. 1. History of Microbiology.
- a) The Beginning.
  - b) The Golden Era.
  - c) The Modern Era.
  - d) List of Nobel Laurates & their Contributions in brief.
- UNIT. 2. Microscopy.
- a) Bright field Microscopy.
  - b) Definition, Magnification, Resolving power
  - \* Principle, Working and Construction of compound microscope.
  - \* Oil immersion lens.
  - \* Lens System & Aberrations.
  - b) Dark field Microscopy.
  - c) Micrometry.
- UNIT. 3. Morphology of Bacteria
- \* Detail Structure, function and Chemical Composition of the following in a bacterial Cell.
  - a) Cell Wall
  - b) Cell Membrane
  - c) Spores.
  - d) Capsule.
  - e) Flagella.
  - f) Fimbriae.
  - g) Nuclear Material
  - h) Ribosomes
  - i) Cell inclusions.

Term II

- UNIT. 4. Stains and Staining Procedures
- a) Types of Stains
  - b) Classification of Stains
  - c) Basic Staining Procedures.
  - \* Monochrome Staining
  - \* Gram's Staining
  - \* Negative Staining
  - \* Acid Fast Staining

(10)

...2/-

(2)

. 2 .

- UNIT. 5 Sterilization and Disinfection
- a) Sterilization
    - \* Principles & Mode of action of heat. Radiation, Filtration, & Chemicals.
  - b) Disinfection
    - \* Agents and their mode of action
    - \* Phenol coefficient
    - \* MIC
- UNIT. 6 Nutrition and Cultivation of Bacteria (15)
- a) Nutritional requirements of bacteria
  - b) Definition of nutritional Categories of bacteria.
  - c) Cultivation of bacteria
    - (i) Media and its types
    - (ii) Techniques of Cultivation of following:
      - \* Bacteria (Isolation methods)
      - \* Fungi (Slide culture Method)

UNIT. Nos. 1, 2, & 3 for term end Examination.

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n/-



(3)

MICROBIOLOGY PAPER-II

TERM-I

- UNIT. 1. Classification & Identification of Bacteria (12)  
a) Introduction to bacterial Classifications  
b) Introduction to Identification of Bacteria.
- UNIT. 2. Out line Classification of Algae & Fungi (04)
- UNIT. 3. Studies on Viruses (14)  
a) Discovery  
b) Structure  
c) Cultivation with reference to tissue cultures chick embryo techniques.  
d) Classification on the basis of RNA & DNA
- UNIT. 4. Growth of Bacteria (10)  
a) Phases of Growth  
b) Growth rate & Generation time.  
c) Measurement of growth

Term - II

- UNIT. 5. Effect of Environmental factors on bacteria (12)  
a) Temperature  
b)  $p^H$   
c) Osmotic pressure  
d) Water activity  
e) Surfactants  
f) Radiations  
g) Gases
- UNIT. 6. Applied Microbiology (28)  
a) Water Microbiology  
\* Microflora of water  
\* Tests for potability of water  
\* Indicators of water pollution.  
b) Milk Microbiology  
\* Composition of Milk  
\* Microflora of Milk  
\* Spoilages of Milk  
\* Pasteurization  
c) Food Microbiology  
\* Microflora of food

...2/-

(4)

. 2 .

- \* Spoilages of food
- \* Preservation of food
- b) Air Microbiology
  - \* Microflora of Air
  - \* Enumeration of bacteria in air
  - \* Droplet & Droplet nuclei, Aerosoles.
  - \* Laminar Air flow
- e) Soil Microbiology
  - \* Texture of Soil
  - \* Types of Soil
  - \* Soil microflora
  - \* Rhizosphere
  - \* Role of microorganisms as biogeochemical agents in Soil.

UNIT Nos. 1, 2, 3, & 4 for term end examination..

n/-

PRACTICAL COURSE-I

1. Use of compound Microscope.
2. Demonstration of Laboratory Instruments.
3. Preparation of Nutrient broth/Agar
4. Preparation MacConkey's broth/Agar
5. Isolation of bacteria by the following

## Methods -

- a) Streak Plate method
  - b) Pour plate method
  - c) Spread plate method
6. Study of cultural characters of the following bacteria.
    - a) E. Coli
    - b) Bacillus subtilis
    - c) Staphylococcus aureus
  7. Staining procedures of bacteria.
    - a) Monochrome staining
    - b) Gram's staining
    - c) Negative staining
    - d) Acid fast Staining
  8. Study of bacterial Motility by :
    - a) Hanging drop preparation
    - b) Swarming growth method
  9. Study of following biochemical tests.
    - a) Sugar fermentations (Glucose, lactose, maltose, Sucrose.)
    - b) H<sub>2</sub>S production.
    - c) IMVIC tests
  10. Bacteriological examination of water.
    - a) Qualitative Examination
    - b) Quantitative Examination.

(6)

NORTH MAHARASHTRA UNIVERSITY,  
JALGAON.

List of Books

- 1) Salle A.J. Fundamental Principles of Bacteriology (1974)  
Tata Mc Graw Hill Publishing Co. New Delhi
- 2) Pleczar M.J. Reid R. D. Chan E.C.S.  
Microbiology 5th Edition (1986)  
Tata Mc Graw Hill Publishing Co New Delhi.
- 3) Frobisher M. Hindill & Others.  
Fundamentals of Microbiology 9th edition.  
W.B. Sanders & Co. Philadelphia
- 4) Stanier, Roger Y., Adelberg & Others General Microbiology  
5th edition Mac Millan, London
- 5) Brock Thomas D, Brock Katherin M & others: Basic Microbiology  
with applications 3rd edition  
Prentice Hall, New Jersey 1986
- 6) Davis Bernard, Dubecco, & others  
Microbiology, 4th edition  
Harper & Row, Philadelphia 1980
- 7) Frazier C. William  
Food Microbiology 4th edition  
McGraw-Hill Book Company New York. (1988)
- 8) Alexopoulos, Constantine J.  
Introductory Mycology 2nd edition  
Willey Eastern New Delhi 1978
- 9) Alexander Martin  
Soil Microbiology
- 10) Luria S.E., Darnell James E & others  
-General Virology 3rd Edition  
John Willey & Sons, New York 1978
- 11) Bergy, Kreig, Noel R  
Manual of Systematic Bacteriology 9th edition  
William & Wilkings, London 1984
- 12) G. M. Smith  
Cryptogamic Botany Vol I

n/-

NORTH MAHARASHTRA UNIVERSITY, JALGAON

SYLLABUS FOR F.Y.B.Sc. (MATHEMATICS)

(WITH EFFECT FROM JUNE, 1992)

PAPER - I : CALCULUS

FIRST-TERM :-

- 1] Continuity of function of a real variable, properties of a continuous functions on closed and bounded intervals namely
  - a) Boundedness
  - b) Attains its bounds
  - c) Intermediate value theorem.
- 2] Differentiability of a function of one variable, mean value theorems, indeterminate forms, L-hospital's rule (without proof)
- 3] Successive differentiation, Leibnitz's rule
- 4] Taylor's and Maclaurin's theorems, expansion of  $e^x$ ,  $\cos x$ ,  $\sin x$ ,  $\log(1+x)$ ,  $(1+x)^m$   $m$  is any rational as indefinite series. (Assuming  $R_n \rightarrow 0$ ). Maxima, minima using Taylor's theorems.

SECOND - TERM :-

- 5] Integration as antiderivative methods of Integrations
  - a) Integration by substitution
  - b) Integration by parts
  - c) Integration by partial fractions
  - d) Integration of irrational algebraic functions.
- 6] Reduction formula  $\int_0^{\pi/2} \sin^m x \cos^n x dx$ ,  $\int_0^{\pi/2} \frac{\sin nx}{\sin x} dx$  ( $n > 1$ ).
- 7] Definite integral as a limit of a sum, Applications of Integration. Area of plane regions. Rectification, volume and surface area of revolution.
- 8] Numerical Integration, Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules.

## PAPER - II : MATRICES &amp; DIFFERENTIAL EQUATIONS

## FIRST - TERMS MATRICES

- 1] Adjoint of a square matrix.  
Inverse of a square matrix: Existence & uniqueness.  
Inverse by Adjoint method (up to order 3)
- 2] Rank of a matrix: Elementary matrices, Reduction to normal form, Definition of rank of matrix, Invariance of rank of a matrix through elementary transformations
- Theorem  $\rho(AB) \leq \text{Min} \{ \rho(A), \rho(B) \}$
- 3] Linear Equations:
- i) Homogeneous system
- ii) Non-homogeneous system | consistency & solutions.
- 4] Quadratic Forms:
- i) Congruent transformation
- ii) Reduction to canonical form, signature, Index
- iii) Definite, semidefinite and Infinite forms.

SECOND - TERM : DIFFERENTIAL EQUATIONS

- 1] Differential equations of the first order and first degree: variables separable, Homogeneous & non-homogeneous equations, Exact equations, Integrating factors, Linear equations, equations reducible to linear form
- 2] Equations of First Order and Higher Degree:
- i) Solvable for x
- ii) Solvable for y
- iii) Solvable for p
- iv) Clairaut's form
- 3] Orthogonal Trajectories

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PAPER - III (A) : GEOMETRY FIRST TERM

- 1] Change of axes: Translation & rotation, Invariants, classification of conics. Reduction of general equation of second degree in  $x$  &  $y$  to the standard form
- 2] Co-ordinates of a point in space: distance formula, section formula, change of origin (Revision)  
lines: direction cosines, direction ratios, symmetric and parametric equations of a line, Angle between two lines, distance of a point from a line.  
Planes: General equation of a plane, intercept form, Normal form, line as intersection of two planes, distance of a point from a plane angle between (i) two plane (ii) a line and a plane skew lines: shortest distance

SECTION - IERM

- 1] Sphere : General & standard equation, section of a sphere by a plane condition of tangency, intersection of two sphere, power of a point Radical plane
- 2] Cylinder: Definition & Equations, Enveloping cylinder, right circular cylinder
- 3] Cone: Definition, cone with a given vertex and guiding curve, right circular cone.
- 4] Conicoids: Standard form, tangent plane, condition of tangency, normal line

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F.Y.B.Sc.

PAPER - III (B) : DISCRETE MATHEMATICS

FIRST - TERM :-

- 1] Sets: Relations and functions (revisions). Equivalence relations, equivalence classes, partition of a sets.
- 2] Logic: Statement and compound statement, conjunction, disjunction, negations, propositions, and truth tables, tautologies, contradictions, logical equivalence. Algebra of propositions, conditional and biconditional statement, arguments, logical implications, quantifiers.
- 3] Boolean algebra: Lattices and algebraic systems, principal of duality, basic properties of algebraic systems defined by lattice, distributed and complimented lattice. Boolean lattice and Boolean algebra. Uniqueness of finite Boolean algebra, Boolean function and Boolean expressions. Propositional calculus design and implimentation of digital networks.

SECOND - TERM : GRAPH THEORY

- 1] Introduction: Graph, finite and infinite graphs. Incidnece and degree. Isolated vertex, pendant vertex and null graph, complete graph regular graph.
- 2] Paths and circuits: Isomorphism, subgraph, walk paths and circuits components connected graph, disconnected graph, Eulers graph, operations on graph, Hamiltonian paths and circuits. The travelling saleman problem.
- 3] Cut-sets and cut-vertices: Cut-sets, some properties of a cut-set. All cut set in a graph fundamental circuits and cut-sets.
- 4] Trees and Fundamental Circuits: Trees, some properties of terees. Distance and centres in a tree. Rooted and Binary trees, spanning trees, Fundamental circuits. Finding all spanning trees of a graph.
- 5] Matrix Representation of graph: Incidence matrix. Adjacency matrix, circuit matrix. Planer and colouring.
- 6] Directed graphs: Directed graph, types of digraphs. Binary relations. Directed paths and connectedness. trees with directed edges, adjacency matrix of a digraph.



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COMPUTER SCIENCE

TERM - I

SECTION - I

INTRODUCTION TO COMPUTERS.

1)	Introduction: History, Block-diagram, Bus structure, Generations and Types Mini, Micro, Mainframe, Super, Definition of software, hardware. Advances, differences & limitations in Today's Computer System. Applications: Engineering, Scientific, Commercial, Space, Communication, Education, DTP (Desk Top Publishing.)	-7
2)	Algorithm: Definition of Algorithm & flowchart Developing algorithm & flowcharts.	-3
3)	Memory: Memory cell, Block Diagram, Parameters, RAM, ROM, PROM, EPROM, Volatile & Nonvolatile semi. memory, Magnetic core, Magnetic Bubble Memory.	-6
4)	I/O Devices: Punch card, paper-tape, TTY, Printers (Chain, Serial Plotter, laser), Graphic display devices, hard-disk, floppy-disk (Sector, Cylinder, Track, Seek-time, Latency time), Magnetic type, Character Readers, CRT.	-12
5)	Data Representation: Numbering System (Binary, Hex, Octal), ASCII & EBCDIC character coding Error Detecting, correcting codes, parity bit, Hamming code.	-6
6)	Operating System: Need, definition, Types (single user, multiuser, Time sharing, Real time, Batch mode etc).	-6
7)	Main Features of DOS & commands.	-3

REFERENCES:

1.	Fundamentals of Computers.	:	By Rajaraman
2.	Computers Today.	:	By Sanderson
3.	MS-DOS Manual	:	
4.	Computer Studies	:	By C. French
5.	Computer & Common Sense.	:	By. Hunt, J. Shelly
6.	An Introduction to Digital Computer Design	:	By Rajaraman & Radhakrishnan.

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TERM - I : SECTION - II

PAPER : PROGRAMMING IN C (I)

- 1) Scope of language. Distinction & similarities with other higher level & lower level languages, Special features and application areas. (a discussion). -3
- 2) Types, Operators & expressions: variable names, data types & sizes, constants, declarations, arithmetic operators, relational & logical operators, type conversions, increment & decrement operators, Bitwise logical operators, conditional expressions, precedence & order of evaluation. -(10)
- 3) Input & Output : Standard input & output, Formatted Output-print, Variable length Arguments lists, Formatted Input-scanf -(3)
- 4) Control flow: Statements & blocks, if-else, else-if, switch, loops- while & for, do-while, break, continue, goto & labels. -(10)
- 5) Functions & Program structures- Basics, functions returning non-integers, more on function arguments, external variables, scope rules, static variables, register variables, block structure, initialization, recursion, the C-preprocessor -(15)

REFERENCES :

1. The C Programming Language : By Kernighan & Ritchie.
2. Programming in C. : By Kochan
3. C made easy : By Herbert

TERM - I

LAB - WORK

1. Demonstration on booting of system & Familiarity with peripheral devices.
2. DOS comand-dir, type, copy, erase, re name, print & Introduction to Turbo-C editors.
3. i) Find the compound & simple intrest  
ii) Check the no. is PALINDROME or not.

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4. i) Roots of quadratic equation.  
ii) To generate 20 terms of fibonacci.
5. i) Generate all prime nos. in the given range.
6. i) Read given numbers in words (93/-Nine Hundred Thirty Seven).
7. i) Sum of series (sin,cos).
8. i) To find Factorial of any Number
9. i) Matrix Multiplication.  
ii) Matrix Transpose.
10. i) Demonstration on FORMAT, DISKCOPY, AUTOEXEC.BAT, XCOPY, BACKUP, RECOVERY.

TERM : II

SECTION : I

Dbase3 + & Packages

- 1] Work Processing: Create document & nondocument files, Print using different options- Underline, Boldface etc. -4
- 2] DBASE II+ :
  - i) Managing Database.
    - a) Create record structure.
    - b) Adding data.
    - c) View & edit data structure. -1
  - ii) Searching & Sorting Databases.
    - a) Locating Records with conditions.
    - b) Sort & index. -2
  - iii) Report Generation
    - a) Create, modify & print Reports.
    - b) Totalls & subtotals. -3
  - iv) Arithmetic with database
    - a) Counting no. of records.
    - b) Date Arithmetic. -2
  - v) Use of multiple files.
    - a) Master file updation.
    - b) Setting relations.
    - c) Database summary. -3

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vi) Programming.

- a) Variable declaration.
- b) Math function.
- c) Conditional statements
- d) Loop Constructs.
- e) Input, Output.
- f) Formatted screen display.

-10

Note : Commands to be covered:

ACCEPT, APPEND, AVERAGE, BROWSE, CHANGE, CLEAR, CLOSE, CONTINUE, COPY, COUNT, CREATE, DISPLAY, DO, EDIT, ERASE, FIND GO TOP/BOTTOM, INDEX, INSERT, JOIN, LIST, L LABEL, LOCATE, MEMORY, MODIFY, PACK, PRINT, QUIT, RECALL, REINDEX, RELEASE, RENAME, REPLACE, REPORT, RESTORE, RUN, SAVE, SEEK, SELECT, SET, SORT, STORE, SUM, TOTAL, TYPE, USE, UPDATE, WAIT, ZAP.

Function to be covered:

BOF(), CHR, CMONTH, CALL, CTOD, DATE, DAY, DELETE, DTOC, EOF(), INT, LSN, LOG, LOWER, MONTH, RECNO(), TIME, TRIM, VAL, YEAR

Programming Constructs to be covered:

IF ELASE ENDIF, DO CASE, ENDCASE, DO WHILE, ENDDO, SKIP, RETURN.

3> LOTUS:

- i) Introduction : Getting started with simple worksheet, entering simple text & formulate with simple worksheet commands. File save. Retrieve options. -2
- ii) Worksheet commands:  
Insert, Deleta, Global., Range, Status, Titles, Window, Copy, move. -2
- iii) Worksheet Functions & Utilities:  
Mathematical functions, Statistical functions. -1
- iv) Data Commands :  
Distribution, Query, Sort, Tables. -2
- v) Graph Commands:  
Types, Names, View, Options, Print-Utility. -2

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### REFERENCES :

1. Understanding DEASE3+ : By Alan Simpson.
2. Mastering DBASE3+ : By Carl Townsend.
3. Mastering 123 : By Carolyn Jorgerson.
4. Understanding Wordstar :

### PROGRAMMING IN C(C)

- 1] String function, memory management, graphics function. Pointers & Arrays: Pointers & address, Pointers & function arguments, Pointers & arrays, Address Arithmetic, character pointers & function, multidimensional array, pointers arrays pointer to pointers, initialisation of pointer arrays, pointers v/s multidimensional arrys. command line arguments, pointer to function. -(15)
- 2] Structure, Union, Typedef : Basic structure, pointer to structure, nested structure, self-referential structures, feilds union, typedef. -(5)
- 3] File Handling: Sequential file handling. Expected to be covered problems on file creation & access. some micellaneous functions. -(15)
- 4] Graphics:  
Graphics Functions: circle(), ellipse(), initgraph() line()  
etc. -(3)

### REFERENCES

1. The C Programming Language : By Ritchie & Kerningham
2. Programming in C. : By Kochan.
3. C Refrence Manual.

### LAB WORK - II

#### C-LANGUGE.

- 1] Create result-file for six subjects & using the file print mark sheets, (Use C-Language).

WORDSTAR.

Using WORDSTAR commands, prepare application letter.

DBASE\_III+.

- 1] Create data bases files with following feilds & enter 5 records each.
- |                |                           |
|----------------|---------------------------|
| file Name: LIB | file name: BORROW         |
| Book Title     | Borrow Code (T/S)         |
| Book no        | Book no                   |
| Section code   | Issue date                |
| Subject code   | (T: Teachers, S:Students) |

You are required to match the two files & print report of no. of books borrowed by teachers & students. Also print a report for overdue books. One week time is given for returning books for students & 4 weeks for the teachers.

- 2] Find the Gross annual salary & find the Taxable income according to the following rules.
1. Gross Annual salary + Basic + DA + City Allowance.
  2. Deduct the annual Profession Tax from Gross giving Net Salary.
  3. Deduct from net slary 33% of net or 12,000 whichever is less.
  4. Deduct Rs. 8,000 as standard deduction.

LOTUS:

- 1] Prepare sales survey report using 123.

JBB/17192

NORTH MAHARASHTRA UNIVERSITY, JALGAON

Syllabus of F.Y.B.Sc. - Physics - I  
(With effect from June, 1992)  
Section-I

MECHANICS & PROPERTIES OF MATTER

Unit-I

MOTION:- Projectile Motion (Without resistive force), Two stage rocket, Geo Stationary orbits. Kepler's Laws  
(Statements only) 5 periods.

ROTATIONAL MOTION :-

Moment of Inertia :- Physical significance of radius of gyration. M.I. of rod/disc. spherical shell and sphere about different axes of rotation. M.I. of Ply-wheel (Torque & K.E), A body rolling down the inclined plane. 6 periods.

Unit-II - Properties of Matter

1) Elasticity :-

Definition of  $Y, K, n, \phi$ . Relation between  $Y, K, n$  and  $\phi$ . Expression for  $n$  by torsional oscillations. Work done during longitudinal, Volume and shearing strain. 6 periods

2) Viscosity :-

Stream-line flow and turbulent flow of liquid through capillary tube. (Poiseuille's method), stoke's Law & its applications. (Determination of Viscosity of liquid) 5 periods.

3) Surface Tension :-

Definition & explanation of surface tension on the basis of molecular theory. Surface Tension as surface energy. Angle of contact and its explanation on the basis of intermolecular forces. Relation between S.T. pressure and curvature, application of S.T. Soap bubble, rise of liquid in a capillary tube with explanation and derivation. Determination of S.T. (Experimentally) 10 periods.

Section-II

MATHEMATICAL PHYSICS

Unit - I

COMPLEX ALGEBRA:- Idea of complex number (about addition, subtraction, multiplication and division) Argand diagram. Rectangular & Polar form of complex number. Euler's formula (exponential form & its application) Algebra complex numbers using Argand diagrams.

(2)

De-Moivre's theorem (Statement only) trigonometrical functions; Application of exponential form for power and roots of complex number. Application of complex number to determine velocity and acceleration. Hyperbolic functions, representation of A.C. by complex number.

12 periods.

### Unit-II

#### PARTIAL DIFFERENTIATION:-

Definition of partial differentiation, total differential, chain rule, implicit functions, change of variable from cartesian to polar co-ordinates.

6 periods.

### Unit-III

VECTOR ALGEBRA & VECTOR ANALYSIS:- Revision of Scalar and vector product of two vectors. scalar product and vector triple product, geometrical interpretation of Scalar triple product.

Scalar and vector fields (Gradient of Scalar), del operator, differential and integration of a vector (line, surface, Volumes) divergent and curl of a vector, their physical significance, Laplacian operator.

Discussion on following identities.

15 periods

- i)  $\nabla \times (\nabla \phi) = 0$  i.e. Curl grad  $\phi = 0$
- ii)  $\nabla \cdot (\nabla \times \vec{A}) = 0$  i.e. div curl  $\vec{A} = 0$
- iii)  $\nabla \times (\nabla \times \vec{A}) = \nabla (\nabla \cdot \vec{A}) - \nabla^2 \vec{A}$
- iv)  $\nabla \cdot (\phi \vec{A}) = \phi (\nabla \cdot \vec{A}) + \vec{A} \cdot (\nabla \phi)$
- v)  $\nabla \cdot (\vec{A} \times \vec{B}) = \vec{B} \cdot (\nabla \times \vec{A}) - \vec{A} \cdot (\nabla \times \vec{B})$
- vi)  $\nabla \times (\phi \vec{A}) = \phi (\nabla \times \vec{A}) - \vec{A} \times (\nabla \phi)$   
 $= \phi (\nabla \times \vec{A}) + (\nabla \phi) \times \vec{A}$ .



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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

PHYSICS PAPER-II

I-ELECTRICITY & ELECTROMAGNETIC FIELDS

UNIT-I

ELECTROSTATICS :-

Study of dielectric, Electrical polarization  $p$ , electric displacement Vector  $D$ , Use of dielectric in capacitor, Introduction to electrical images and force between two point charges by the method of electrical images. Boundary conditions for  $E$  &  $D$  at dielectric media. Analogy of  $E, M, H$  vectors  $D, P, E$  vectors.

8 periods

UNIT-II

CURRENT ELECTRICITY

Kirchoff's Laws, Method of loop analysis of network. Thevenen's theorem, Norton's theorem with illustrations, Maximum power transfer theorem (for all theorems source is D.C.) Current density vector, Power consumption and Joule's law, Watt.

8 periods.

UNIT-III

ELECTRO-MAGNETIC INDUCTION:-

Self inductance, mutual inductance, Principle of transformer, Relation between turns ratio, efficiency of transformer. Discussion of losses.

4 periods.

UNIT-IV

ELECTRICAL D.C./A.C. CIRCUITS :-

Growth and decay of currents in a circuit, charging and discharging of a condenser through a resistor.

6 periods.

L.R. Circuits./L-C-R series and parallel circuits. Expression for impedance, reactance, band width, Q factor, resonance, power factor, choke.

(4)  
II - ELEMENTARY KINETIC THEORY, HEAT & THERMODYNAMICS

UNIT-I

KINETIC THEORY OF GASES :-

Mean free path (simple derivation )  
Maxwell's velocity distribution law, average velocity RMS velocity, most probable velocity and their correlation. Transport phenomenon, coefficient of viscosity, Thermal conductivity (approximate derivation) 8 periods.

Equation of state: Andrews experiment and Amagat's experiment, van-der-waals equation, critical constants. Reduced equation of state, Boyle's temperature. 6 periods.

UNIT-II

Isothermal, adiabatic, isochoric & isobaric changes, work done on a gas & by a gas. Indicator diagram, work done in isothermal and adiabatic changes. Reversible and irreversible processes, statement of first, second & third law of thermodynamics. Entropy, Entropy-temp. diagram (Change of phase). First & Second latent heat equation, Dissipation of energy & increase of entropy in natural processes. 10 periods.

UNIT-III

Carnot's cycle, Otto cycle, Diesel cycle. The refrigerator principle, steps in refrigeration plant and P-V diagram, symbolic representation of refrigerator. Applications of refrigerator (Heating and cooling of the house) 10 periods.

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NORTH MAHARASHTRA UNIVERSITY, JALGAON  
SYLLABUS FOR F.Y.B.Sc. (WITH EFFECT FROM JUNE 1992)

ELECTRONICS  
=====

Approved syllabi of F.Y.B.Sc. :-

PAPER - I SECTION A (FIRST TERM)

Passive Electronic components and network theorems.

- 1] RESISTORS :- Symbol, colour code, types such as carbon, metal-film, thin-film, wire-wound, variable resistors (Logarithmic and linear potentiometer and presets) (06 periods)
  - 2] CAPACITORS :- Symbol, colour-code, types such as paper, mica, tantalum, polystyrene, electrolytic, variable capacitors (gang and trimmer). (06 periods)
  - 3] INDUCTORS :- Symbol, types such as air core, iron-core, ferrite core, chokes. (05 periods)
- The study of above passive components should be as regards to
- i) composition/construction/design
  - ii) range values
  - iii) practical limitations
  - iv) electrical properties
  - v) parameters/ ratings / specifications
  - vi) additional information.
  - vii) fields of applications.
- 4] SWITCHES :- Idea of SPDT, DPDT switches. Types such as toggle switch, rotary switch, relay as a switch (electromagnetic) (02 periods)
  - 5] NETWORKS :- Tuned circuits (series and parallel resonant), coupled circuits (transformer coupled and doubly tuned), passive filters (low pass, high pass, band pass using R.L. and C. elements). (09 periods)
  - 6] NETWORK - THEOREMS :- Kirchhoff's current and voltage laws. Thevenin's theorem, Norton's theorem, maximum power transfer theorem, superposition theorem. (8 Periods)

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REFERENCE BOOKS

1. Understanding of electronic components : Walter
2. Electronic principles : V.K. Mehta
3. Basic electronics : B. Grob.
4. Basic Electronics : D.C. Tayal
5. Networks, lines & fields : J.D. Ryder (4th edn)
6. Electronic fundamentals and applications: J.D. Ryder
7. A monograph integrated electronics & circuits : Ketan & Goyal
8. Circuit Elements : Philips Publication

PAPER - I SECTION B (SECOND TERM) : DIGITAL ELECTRONICS

- 1] **NUMBER SYSTEMS** :- Decimal, Binary, Octal, Hexadecimal number systems, BCD code, Intercorversion of decimal, binary, and hex numbers. (06 Periods)
- 2] **LOGIC GATES** :- Positive and Negative logic, OR, AND, NOT, NAND and EX-OR gates, Study of 7400, 7402, 7404, 7408 IC's [internal logic diagrams & pin connections] Diode logic, TTL and Emitter coupled logic, Basic building blocks of TTL gates, Multimeter input transistor inverter, Totem-pole and open-collector outputs. (10 Periods)
- 3] **BINARY ARITHMETIC AND BOOLEAN ALGEBRA** :- Binary addition and subtraction, 1's complement, 2's complement, Half and full-adders, Boolean axioms, D'Morgans' theorems (statement, verification and application). (10 Periods)
- 4] **FLIP-FLOPS** :- R-S, clocked R-S J-K, Master slave J-K, D and T flip-flop (using logic gates). (06 Periods)
- 5] **COUNTERS** :- 4-bit binary counter, Decade counter, BCD counter. (04 Periods)

**REFERENCE BOOKS**

1. Digital principles & applications, Malvino & Leach
2. Digital Electronics : R.P. Jain
3. Digital Electronics : Gothman
4. Digital Electronics : V.K. Jain
5. Digital Computer Electronics : A.P. Malvino

PAPER - II SECTION A(FIRST TERM) : SEMICONDUCTOR DEVICES

- 1] SEMICONDUCTORS :- Review of atomic structure, Formation of energy bands, Energy diagrams for conductors, Semiconductors and insulators, Charge carriers in semiconductors (Electron-hole pair), Intrinsic and Extrinsic semiconductors, Doping (P and N type semiconductors). (08 Periods)
- 2] P-N JUNCTION :- Junction diode, Depletion layer and barrier potential, Effect of forward and reverse bias on depletion layer and barrier potential. I-V characteristics. Junction diode as a switch and as a rectifier, Study of Zener diode, varactor diode, photodiode, LED (Symbol, biasing and applications). (06 Periods)
- 3] BIPOLAR JUNCTION TRANSISTOR (BJT) :- Principle of operation, CB, CE and CC configurations, Input, Output and Transfer characteristics for CE configuration, Relation between alpha and beta. (04 Periods)
- 4] UNI-JUNCTION TRANSISTOR (UJT) :- Basic working principle Characteristics and use as a switch and relaxation oscillator. (04 Periods)
- 5] FIELD EFFECT TRANSISTOR (FET) :- Basic working principle, characteristics, Pinch-off Voltage, use of FET as VVR, depletion and enhancement type MOS-FETs. (05 Periods)
- 6] SILICON CONTROLLED RECTIFIER (SCR) :- Four-layer diode, Characteristics, Use of SCR as a switch, Triac. (04 periods)

REFERENCE BOOKS

1. SOLID-STATE DEVICES : Taper (Vol. I)
2. BASIC ELECTRONICS : D.C. Tayal
3. BASIC ELECTRONICS FOR SCIENTISTS : Jamesh J. Brophy
4. ELECTRONIC PRINCIPLES : V.K. Metha
5. BASIC ELECTRONICS : P. Grob
6. ELECTRONIC PRINCIPLES : A.P. Malvino
7. SEMICONDUCTOR DEVICES : Millman and Halkias

PAPER - II SECTION B (SECOND TERM) : BASIC ELECTRONIC CIRCUITS

- 1] RECTIFIER CIRCUITS :- Half wave, Full wave and bridge rectifier circuits, capacitive filter, LC filters (capacitor input, choke input and  $\pi$  filters), ripple factor, voltage doubler.
- 2] TRANSISTOR BIASING METHODS :- Fixed bias, Collector to base bias, and self-bias circuit. (04 Periods)
- 3] AMPLIFIER CIRCUITS :- single stage R-C coupled CE amplifier, AC & DC Load line, Operating point Thermal runaway, class A, class B and Class C amplifiers, crossover distortion, push-pull amplifier. (06 Periods)
- 4] OSCILLATOR AND MULTIVIBRATOR CIRCUITS :- Positive and negative feedback, Effects of negative feedback, Barkhausen criteria, Phase-shift oscillator, Astable, monostable and bistable multivibrators (transistorised). (08 periods).
- 5] DIFFERENTIAL AMPLIFIER CIRCUITS :- Black-box concept, common mode and differential mode, CMRR, Analysis of single ended and differential input (03 Periods)
- 6] OPERATIONAL AMPLIFIER CIRCUITS (OP-AMP) :- Symbol, Ideal Characteristics, Inverting and Noninverting configurations, Virtual ground, Ic 741 pin connections (DIP and TO packages) and characteristics. OP-AMP as an adder, subtractor, differentiator and integrator. (06 periods).

REFERENCE - BOOKS :

1. Electronics principles - A.P. Malvino
2. Integrated Electronics - MILLMAN & HALKIAS
3. OP-AMP - G.B. CLYTON
4. Pulse, Digital & Switching waveforms Millman & Taub
5. Solid state Devices - Taper (volume - II)
6. Electronics Devices and circuits - Allen Mottershead.

## PRACTICALS:

### PAPER - III (FIRST TERM )

- i) Demonstration of electrical and electronic components R.L.C. transformer, choke, switches, relay, diode, BJT, UJT, FET etc. (Nomenclature types, ratings, etc.)
- ii) Use of analog and digital multimeters (measurements of R, voltage and current).
- iii) Use of Signal generator/function generator (measurement of o/p frequency/amplitude)
- iv) Use of CRO (measurement of freq./period and amplitude)
- v) Use of power-supply (Dual, fixed, variable and current limit)
  - 1] study of series and parallel resonance circuits.
  - 2] R-L filters and R.C. filters (low, high and band pass)
  - 3] Verification of Thevenin and Norton theorems and Maximum power transfer theorem.
  - 4] P-N junction characteristics.
  - 5] BJT characteristics.
  - 6] UJT characteristics.
  - 7] FET characteristics.
  - 8] SCR characteristics.

The above five exercises/experiment (i) to (v) should be regarded as prerequisite.

### Paper-III (Second Term) :--

- 1] A) OR and AND gates using Diode logic and B) Study of logic gates (OR, AND, NOT, NAND, NOR) using various ICs (truth table verification)
- 2] Half-adder, full-adder circuits
- 3] verification of D'Morgan's theorems.
- 4] Study of flip-flops using various ICs.
- 5] Study of rectifier circuits with filters, calculations of ripple-factor.
- 6] Single stage R-C coupled amplifier (with and without feedback)
- 7] A stable multivibrator (Transistorised)
- 8] OP-AMP (741) - parameters (o/p and i/p impedance measurement)