PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: BOTANY

Name of the Course: B.Sc. II (Sem.–III& IV)

(Syllabus to be implemented from w.e.f. June 2020)

Draft Structure for B. Sc-II

Core Subject: Botany

PUNYASHLOK AHILYADEVI HOLKAR
Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS) (w.e.f.2020-21)

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	B.Sc.- II Semester – III									
Core (*Students can opt any Three subjects among the Four	DSC 1C	Paper-V		3.0	--	--	50	40	10	4.0
		Paper-VI		3.0	--	--	50	40	10	
Subjects offered at B.Sc.I. Out	DSC 2C	Paper-V		3.0	--	--	50	40	10	4.0
of Three Subjects offered One		Paper-VI		3.0	--	--	50	40	10	
Subject will be the Core Subject OR	DSC 3C	Paper-V		3.0	--	--	50	40	10	4.0
		Paper-VI		3.0	--	--	50	40	10	
	AECC - Environmental Studies			3.0	--	--	-	-	-	NC
	SEC-1			2.5			50	40	10	2.0
Grand Total				23.5	--	--	350	280	70	14
Class :	B.Sc.- II Semester – IV									
Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe	DSC 1D	Paper-VII		3.0	--	--	50	40	10	4.0
		Paper-VIII		3.0	--	--	50	40	10	
	DSC 2D	Paper-VII		3.0	--	--	50	40	10	4.0
		Paper-VIII		3.0	--	--	50	40	10	
	DSC 3D	Paper-VII		3.0	--	--	50	40	10	4.0
		Paper-VIII		3.0	--	--	50	40	10	

Elective Subject			L	T	P	Total	UA	CA	Credits
	SEC-2		2.5			50	40	10	2.0
Total (Theory)			20.5	--	--	350	280	70	14
DSE (Practical)	DSC 1C & 1D	Pr. III&IV	--	--	8	50	40	10	4.0
	DSC 2C & 2D	Pr. III&IV	--	--	8	50	40	10	4.0
	DSC 3C & 3D	Pr. III&IV	--	--	8	50	40	10	4.0
Total (Practical)					24	300	240	60	12
Grand Total			43.5		24	1000	800	200	40

Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Course

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

SEMESTER- III

Paper V
Plant Anatomy   35Lectures

Unit 1: Meristematic tissue   (8 Lectures)

Introduction, Characteristics and Classification of meristems based on position
Classification of meristem based on origin, position and plain of division.
Theories of structural development
   a)Apical cell theory
   b) Histogen theory
   c) Tunica Corpus theory.

Unit 2. Permanent tissue: (08Lectures)
Simpleand complex tissue
structure and function of simple tissues
   a)Parenchyma . b) Collenchyma c) Sclerenchyma
structure and function of Complex tissue
   a) Xylem   b) Phloem
Types of Vascular bundles

Unit 3. Primary structure of plant body.   (06Lectures)

Primary structure of Monocotyledon and Dicotyledon root.
Primary structure of Monocotyledon and Dicotyledon stem.

Unit 04 . . Secondary structure of plant body.   (08Lectures)
Normal secondary growth in Dicotyledon root and stem
Anamalous l secondary growth in Bignonia (Dicot.) and Dracaena stem.
   4.1Vascular cambium – structure and function
   4.4 Periderm and Lenticel,Tylosis, Wood types.

Unit 5: Tissue system .   (05Lectures)

5.1 : Epidermal tissue system

5.2: Secretary tissue system

5.3:Mechanical tissue system

Paper VI

Plant metabolism   35 Lectures

Unit 1: Enzymes   (8 Lectures)

Introduction.
Classification of enzymes.
mechanism of enzyme action.
Properties of enzymes.

Unit 2: Nitrogen metabolism   (5 Lectures)

Introduction,
Nitrogen cycle
Biological nitrogen fixation – Definition, types and organisms involved,
Mechanism of biological nitrogen fixation.
Significance of biological nitrogen fixation

Unit 3: Plant growth regulators   (8 Lectures)

Introduction
Discovery
Types of growth regulators
a. PGR - auxins, gibberellins, cytokinins (Physiological role of growth regulators)
b. Growth inhibitors – ABA, Ethylene (Physiological role of growth regulators)

U nit 4: Mineral nutrition   (6 Lectures)

Introduction,
Macronutrients, Role of macronutrients (N, P, K), Role of Micronutrients (Fe, Mn.)

Unit 5: Carbohydrate metabolism   (8 Lectures)

Introduction and
Broad classification;
Monosaccharides - Properties and examples (Triose , Tetrose, Pentose and Hexose)
oligosaccharides - Properties and examples (Sucrose , Maltose and Lactose)
Polysaccharides - Properties and examples (Starch and Cellulose)

Paper VII

Plant Physiology   35 Lectures

Unit 1: Plant response to light and temperature   (8 Lectures)

Photoperiodism – Definition, Classification (SDP, LDP, Day neutral plants);
Phytochrome Definition, Role of phytochrome (red and far red light responses on
photo morphogenesis);
   Vernalization: Definition, Mechanism, Significance.

Unit 2: Translocation in phloem   (6 Lectures)

Definition of Symplastic transport and apoplastic transport,
Phloem loading and unloading.
Mechanism of translocation in phloem – Mass flow hypothesis
Source and sink relationship : During vegetative and reproductive phase.

Unit 3: Photosynthesis   (8 Lectures)

Introduction.
Photosynthetic Apparatus
Photosynthetic Pigments (Chl a, b, xanthophylls, carotene);
Light reaction – Cyclic and non cyclic
Dark reaction – C3, C4, CAM Pathway

U nit 4: Respiration   (5 Lectures)

Introduction
Structure of Mitochondrion
Types – Arobic - Glycolysis, Linkage stage and TCA Cycle
ETS

Unit 5: photorespiration   (8 Lectures)

Introduction:
  Site of photorespiration
  Mechanism of photorespiration
  Significance

Paper VIII

EMBRYOLOGY OF ANGIOSPERMS 35 Lectures

Unit 1: Structural organization of flower (9 Lectures)

1.1. Concept of flower as a modified Shoot.
structure of typical flower.
Structure of typical Androceium, Structure of tetrasporangiate anther and pollen grain.
: Structure of typical Gynoecium: Structure of a typical ovule, Types of ovules.

Unit 2.: Pollination and fertilization (9 Lectures)

2.1 Definition, self and cross Pollination
2. 2 **M**echanism in Anemophily (*Zea mays*), Entomophily (*Calotropis*) and Hydrophily (*Vallisneria*)
:Microsporogensis, and development off male gametophyte
:Megasporogenesis and development of female gametophyte: Monosporic (*Polygonum*) and Bisporic (*Allium*)
2.4 **Fertilization**: Entry of pollen tube, double fertilization and triple fusion. Significance of double fertilization.

Unit 3: Embryo and Endosperm Development. (9 Lectures)

3.1 Structure and development of embryo in Monocotyledons.
3.2 Structure and development of embryo in Dicotyledons.
Development of endosperm,.
Types of endosperm- Nuclear, Helobial and Cellular.

Unit 4. : Seed and fruit dispersal (8 Lectures)

Agents and mechanism of seed and fruit dispersal.

Practical- I

1) Study of shoot and root apex by permanent slides.

2) Study of simple tissues.

3) Study of complex tissues.

4) Study of primary structure of dicot and monocot root

5) Study of primary structure of dicot and monocot stem
6) Study of anomalous secondary growth in *Bignonia*.
7) Study of anomalous secondary growth in *Dracaena*.
8) Study of double stained micro preparation in Bignonia *and Dracaena* stem.

9) Study of double stained preparation of anomalous secondary growth in *Dracaena*.

10) Study of anatomy of porous (ring porous & diffused porous) and non porous wood.

11) Maceration technique.

12) Study of Epidermal tissue system.

13) Study of Secretary Tissue system.

14) Study of Mechanical tissue system.

15) Study of role and deficiency symptoms of N, P, K,

16) Study of role and deficiency symptoms of Fe, Mn.

17) Estimation of Chlorophylls by Colourometric / Spectrophotometric method.

18) Separation of photosynthetic pigments by ascending paper chromatography.

19) Study of Kranz leaf anatomy in C4 plants.

20) Estimation of TAN value in CAM plants.

21) Study of evolution of oxygen during photosynthesis.

22) Study of effect of light intensity on photosynthesis.

23) Detection of Phosphate, Potassium and Iron in the plant tissue by biochemical tests.

24) Determination of sugar percentage by hand refractometer.

25) Botanical Excursion Report.

Practical- II

1) Study of typical flower and its parts (floral whorls with their functions).

2) Study of young / mature anther by permanent slide.

3) Study of germination of pollen grains.

4) Detection of pollen fertility by staining technique.

5) Study of types of ovules (by permanent slide or photograph).

6) Study of dicotyledon and monocotyledon embryo (by permanent slide or photograph).

7) Dissection of embryo

8) Study of endosperm from developing seeds (Grevellia /Cucumis).

9) Dispersal of seeds.

10) Dispersal of Fruits.

11) Study of self pollinated plants

12) Study of cross pollinated plants

13) Study of pollination mechanism (Maize, *Calotropis*)

14) Determination of rate of respiration during seed germination by Ganong's respirometer.

15) Effect of different concentrations of Auxins (IAA) on seed germination (any suitable dicot seeds).

16) Effect of different concentrations of Gibberellic acid (GA) on seed germination (any suitable monocot seeds).

17) Effect of different concentrations of Ethylene on fruit ripening
18) Breaking of seed dormancy by mechanical and chemical scarification.

19) Study of effect of pH on Catalase enzyme activity.

20) Study of effect of temperature on Malate dehydrogenase enzyme activity.

21) Janus green B staining technique for mitochondria.

22) Demonstration of fermentation.

23) Study of biofertilizers.

24) Separation of Amino acids by Thin Layer chromatography.

25) Horticulture Term Paper / Field Visit Report / Project Report

Plant Physiology and Metabolism

1. Hopkins, W. G. 1995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
2. Moore, T. C. 1989. Biochemistry and Physiology of Plant Hormones. (2nd edition). Springer – Verlag, New York, USA.
3. Salisburry, F.B. and Ross, C. W. 1992. Plant Physiology. (4th edition). Wadsworth Publishing Co., California, USA. 19
4. Taiz, L. and Zeiger, E. 1998. Plant Physiology. (2nd edition) SinauerAssociates, Inc., Publishers, Massachusetts, USA.
5. R.C. Grewal – Plant Physiology. Campus Books International 483/24, Prahiad street Ansari Road, Darya ganj, New Delhi – 110002.
6. V.K. Jain – Fundamentals of Plant Physiology. S. Chand & Company Ltd. Ramnagar, New Delhi – 110055.
7. Salisbury Ross – Plant Physiology. CBS, Publishers & Distributions 485/ Jain Bhawan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
8. Devlin & Witham – Plant Physiology. CBS Publishers & Distributors 485, Jain Bhavan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
9. G. Ray Noggle / G. Fritz- Introductory Plant Physiology. Prentice Hall of India Ltd. New Delhi – 110001.
10. V.Verma. Text Book of Plant Physiology. Emkay Publications., B-19, East KrishnaNagar, Delhi-1100051.
11. V.I. Paladin. Plant Physiology. Arihant Publishers. Jaypur, (India)
12. Dr. S. Sundara rajan- Physiology of Transport in Plants. Anmol Publications, Pvt. LTD. New Delhi.110002.
13. D.O.hall & K.K. Rao. Photosyntheis. Edward Arnold, East Street, Baltimore, Mary-land- 21202,U.S.A.
14. Bidwell, R.G.S. 1974. Plant Physiology. Macmillan P ub. Co., N.Y.
15. Devlin, R.M. and F.H. Witham. 1983. Plant Physiology. Willard Grant Press. U.S.A.
16. Hans-Walter Heldt. 1997. Plant Biochemistry and Molecular Biology. Oxford University Press, New York. Usa.
17. Jain, V.K. (2000): Fundamentals Of Plant Physiology ,S.Chand&Co, New Delhi.
18. Pandey, S.N. (1991): Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.
19. Verma, V. (2007): Text Book of Plant Physiology. Ane Books India, New Delhi.
20. Nobel, P.S. 2009. Physicochemical and Environmental Plant Physiology.4th edition Academic Press, UK
21. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition. Sinnauers Associates, Saunders land, Massachusetts, USA
22. Helgi OPik, Stephen A. Rolfe, Arthur J. Willis. 2005. The Physiology of Flowering Plants, Cambridge University Press, UK
23. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
24. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. 1997. Plant Metabolism. 2nd Edition. Longman Group, U.K.
25. Fitter, A. and Hay, R.K.M. 2001. Environmental Physiology of Plants. Academic Press, UK.
26. Emil Tmog, Mineral Nutrition of Plants. Oxford and IBH Publishing House, Bombay/ New Delhi.
27. S. Sundara rajan- Plants Physiology. Anmol Publications, Pvt. LTD.New Delhi.110002.

Angiosperm Anatomy and Embryology

1. P.C. Vashista. - Plant Anatomy. Pradip Publications, Opposite Sitla mandir, Jalandhar- 144008.
2. B.P.Pandey - Plant Anatomy. S.Chand & Company,LTD. Ram Nagar, New Delhi.110055.
3. A.C.Datta. - Botany For Degree Students. Press-Delhi, Bombay, Madrass
4. Carlquist, S. 1998.- Comparative Wood Anatomy: Systematic, Ecological and Evolutionary Aspects of dicotyledonous Wood.Springer – Verlag, Berlin.
5. Culter, E.G. 1969. Part I.- Cells and Tissues. Edward Arnold, London.
6. Culter, E.G. 1971. Part II- Organs.- Plant Anatomy: Experiment and Interpretation. Edward Arnold, London.
7. Esau, K. 1977. - Anatomy of Seed Plants. 2nd edition, John Wifey and Sons, New York.
8. Fahn, A. 1974. - Plant Anatomy. 2nd edition. Pergamon Press, Oxford.
9. Lyndon, R.F. 1990. - Plant Development: The Cellular Basis. Unwin Hyman, London.
10. Mauseth, J.D. 1988.- Plant Anatomy. The Bonjamin/Cummings Publishing Company Inc., Metro Park, California, USA.
11. Nair, M.N.B. 1998. - Wood Anatomy and Major Uses of Wood. Faculty of Forestry, Universiti Putra Malaysia, 43400 Serdang, Selangor D.E., Malaysia.
12. Rahvan, V. 2000.- Developmental Biology of Flowering Plants. Springer- verlag, New York.
13. Raven, P.H., Evert, R.F.and Eichhorn, S.E. 1999. - Biology ofPlants. 5th edition. W.H., Freeman and Co., Worth Publishers, New York.
14. Steeves, T.A. and Sussex, I.M. 1989. - Patterns in Plant Development. 2nd edition. Cambridge University, Press, Cambridge.
15. Thomas, P. 2000. - Trees: Their Natural History. Cambridge University Press, Cambridge.
16. Chandurkar P. J. Plant Anatomy. Oxford and IBH publication Co. New Delhi 1971
17. Greulach V A and Adams J E Plant- An introduction to Modern Biology. Toppen Co. Ltd, Tokyo,
18. Eams and Mc Daniel. An Introduction to Plant Anatomy. McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan
19. Adriance S Foster. Practical Plant Anatomy. D Van Nostrand Co. INC, Newyork
20. Pijush Roy. Plant Anatomy. New Central Book Agency Ltd, Kolkata
21. Pandey S N and Ajanta Chadha. Plant Anatomy and Embryology.Vikas Publishing House,Pvt, Ltd, New Delhi
22. Bhojwani S S and Bhatnagar S P. An Embryology of Angiosperms.
23. Maheshwari P. An introduction to Embryology of Angiosperms.
24. Nair P K K. Essentials of Palynology.
25. S. C. Datta. Systematic Botany. New Age International Publishers, New Delhi. (2015).

Center: **Practical II**

Date: **Batch** **Total Marks: 40**

N.B.-

1. Draw neat & labeled diagrams wherever necessary

2. Do not write about points of theoretical information unless asked specifically

3. Perform the experiment as per instructions given by the examiner

----

Make a double stain permeant micro preparation of a T.S. of specimen A and show it to the examiner (No written answer) 07

Macerate the given sample B & prepare a slide from it. Show the slide to the examiner (No written answer) 04

Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 07

Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 04

Q.5. Identification 08

E- Identify & Describe

F- Identify & Describe

G-Identify the role & deficiency symptoms

H-Identify the role & Deficiency symptoms

I- Identify & describe the biochemical test

Q.6. A) Journal 05

B) Excursion Report 05

Center:

Date: **Total Marks: 40**

N.B.-

1. Draw neat & labelled diagrams wherever necessary

2. Do not write about points of theoretical information unless asked specifically

3. Perform the experiment as per instructions given by the examiner

----

Q.1.Determine the fertility of pollen / Perform practical for detection of pollen germination of given specimen A   (Written answer)   04

Q.2.Dissect out the given material B for embryo dissection/describe the dicot or monocot embryo by using permanent slides/photographs(No written answer)   03

Q.3.Identify the mechanism of pollination of given material C   (written answer)   03

Q.4.Perform the practical to detect rate of respiration/Separate the given sample D by TLC to detect amino acids. (Written answer)   06

Q.5.Detect the enzyme activity of given sample E/Detect the mitochondria in given sample E by using specific staining method.   (Written answer)   04

Identification   10

F- Identify & Describe

G- Identify & Describe

H-Identify & describe mode of seed dispersal

I-Identify & describe effect of growth regulators

J- Identify& comment on

Q.6. A) Journal   05

     B) Horticulture term paper   05

SOLAPUR UNIVERSITY, SOLAPUR

Name of the Faculty: Science

Syllabus: Chemistry

Name of the Course: B. Sc. II(Sem-III&IV)

CBCS

With effect from June- 2017

Solapur University, Solapur
B.Sc. Part-II
Chemistry
Choice Based Credit System (CBCS)
In force from June-2017

General Structure :

There will be two theory papers of 70 marks for each semester. There titles & marks distribution are as under.

N. B.

i. Figures shown in bracket indicates the total number of contact hours required for the respective topics

ii. The question paper should cover the entire syllabus. Marks allotted questions should be in proportion to the number of contact hours allotted to respective topics.

iii. All topics should be dealt with S.I units.

iv. Use of scientific calculator is allowed.

v. Industrial tour is prescribed.

Semester-III

Paper-V   : Organic Chemistry 100 marks   (70 + 30 marks)

Paper-VI : Inorganic Chemistry 100 marks   (70 + 30 marks)

Semester-IV

Paper-VII : Physical Chemistry 100 marks   (70 + 30 marks)

Paper-VIII : Analytical & Industrial Inorganic Chemistry 100 marks (70 + 30 marks)

Practical Course :   **Practical Examination will be held at the end of the year   - 200 marks**

A) Distribution of marks :

a) Physical   : 45 marks (35 marks physical experiment + 5 marks oral + 5 marks Journal)

b) Inorganic   : 50 marks
> I (25 marks gravimetric analysis + 15 marks preparation + 5 marks oral + 5 marks Journal)
>
> II(25 marks for semimicro qualitative analysis+15 marks volumetric estimation + 5 marks oral+ 5 marks Journal).

c) Organic   : 45 marks (20 marks for organic qualitative Analysis + 15 marks estimation/preparation+5 marks oral + 5 marks Journal)

B) Duration of Examination –   Two days, 6 hrs. per day

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper: III Organic Chemistry	Paper: V Organic Chemistry
2)	Paper: IV Inorganic Chemistry	Paper: VI Inorganic Chemistry
3)	Paper: V Physical Chemistry	Paper: VII Physical Chemistry
4)	Paper: VI Analytical and Industrial Inorganic Chemistry	Paper: VIII Analytical and Industrial Inorganic Chemistry

Semester-III
Paper-V: Organic Chemistry

Total Credits: 3
(45 Contact hrs.)

UNIT-I   Credits: 1.6   Contact Hrs: 24

1. Spectroscopic Methods (8)
   Ultra-Violet (UV) absorption:

Introduction to Spectroscopy, Beer – Lambert law (mathematical derivation not expected), Types of electronic transitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, Bathocromic Hypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. Calculation of λmax by Woodward-Fieser rules for conjugated dienes and enones. Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and trans) spectral problems based on UV. (Spectroscopic charts will not be supplied)

2. Stereochemistry (8)
   2.1. Geometrical isomerism: Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes.
   2.2. Conformational Isomerism: Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae.
   2.3. Conformational analysis of ethane and n-butane with the help of energy profile diagrams.
   2.4. Nomenclature – D & L, R & S, E & Z systems

3. Alcohols and Phenols (8)
   3.1. Alcohols : Introduction
   i.   Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, HIO_4 and nitric acid, Uses of ethylene glycol.
        Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism.
   ii. Trihydric alcohols: Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol – reaction with electropositive metals, reaction with hydrogen halide HCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol.

   3.2. Phenols : Introduction, Reactions of phenol (carbolic acid) :
      i.   Acylation and Fries rearrangement
      ii. Ether formation and claisen rearrangement
      iii. Gattermann Synthesis
      iv. Carboxylation – Kolbe's reaction
      v.   Reimer – Tiemann reaction and its mechanism.

UNIT- II   Credits: 1.4   Contact Hrs: 21

4. Aldehydes and Ketones (5)

Introduction, Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism and applications 1) Aldol condensation (base catalysed),   2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation..

5. Ethers and Epoxides (5)

5.1. Ethers : Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical reactions of anisole with HI, Gravimetric estimation of $-OCH_3$ group by Ziesel's method (Related problems are expected based on % of $-OCH_3$ and number of $-OCH_3$ groups).

5.2. Epoxides : Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.

6. Carboxylic acids (7)

6.1. Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles CN^-, OH^-, I^-, and NH_3.

6.2. Hydroxy acids : A. Malic acid and B. Citric acid, Methods of formation of malic acid from maleic acid and from α-bromo succinic acid. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid: Acetylation with acetic anhydride reduction by HI, Action of heat at 422^0K. Uses of citric acid.

6.3. Unsaturated acids : Methods of formation A. Acrylic acid from acrolein and by dehydration of β-hydroxy propionic acid. Reactions of acrylic acid – Addition of H_2O, reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation B. Cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid – bromination, oxidation. Uses of cinnamic acid.

6.4. Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, C_2H_5OH in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, NH_3. Uses of phthalic acid.

7. Diazonium Salts (4)

7.1 Diazonium salts : Introduction, benzene diazonium chloride – preaparation, chemical properties.

  i.   Formation of iodo benzene
  ii.   Sandmeyer's reaction
  iii. Formation of benzene
  iv.   Formation of phenylhydrazine
  v.   Azo coupling – synthesis of methyl orange and congo red.

Reference Books :

Latest editions of following reference books.

1. Organic Chemistry. Volume 1 – The fundamental principles by I.L. Finar.
2. Organic Chemistry. Volume 2 – Stereochemistry and the chemistry of natural. Products by I.L. Finar, Low-priced Edn. ELBS – Longman
3. Organic Chemistry. Volume I, II, III by S.M. Mukharjee, S.P. Singh and R.P. Kapoor. Wiley Eastern Limited.
4. Advanced Organic Chemistry by, B.S. Bahl, Arun Bahl. S.Chand & Company, Ltd.
5. Organic Chemistry by Morrison – Boyd.
6. A Text Book of Organic Chemistry by K.S. Tiwari. S.N. Meharotra. N.K. Vishnoi. Vikas Publication, Meerut.
7. Spectroscopic methods in Organic Chemistry by Williams and Fleming. Mc-Graw Hill.
8. Stereochemistry of Organic Compounds by E.L. Eliel. Orient Longman.
9. Stereochemistry of Organic Compounds by P.S. Kalsi. New Age International Ltd.
10. A Guide Book to Mechanism in Organic Chemistry by Peter Sykes.
11. Advanced Organic Chemistry, structure, reactions and mechanism by Jerry March. Mc Graw Hill Kogakusha, Ltd.
12. Spectroscopy of Organic Compounds by P.S. Kalsi.
13. Absorption spectroscopy of Organic molecules by V.M. Parikh.
14. College Organic Chemistry Part I & II by G.R. Chatwal.
15. Stereochemistry by Nasi Puri.
16. Organic synthesis by Smith.

Semester-III
Paper-VI- Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

UNIT-I   **Credits: 1.53   Contact Hrs: 23**

1. Co-ordination Chemistry :   **(16)**
   1.1 Definition and formation of co-ordinate covalent bond in BF_3: NH_3 and in $[NH_4]^+$.
   1.2 Distinction between double salt and complex salt,
   1.3 Werner's theory :   A. Postulates of theory,
                      B. Applications of theory:
                          Theory applied to cobalt amine viz;
                          a].$CoCl_3.6NH_3$ b] $CoCl_3.5NH_3$,   c] $CoCl_3.4NH_3$,   d] $CoCl_3.3NH_3$
                      C. Limitations
   1.4 Description of terms –a] ligand,   b]co-ordination number,
              c] co-ordination sphere,   d]effective   atomic number,
              e] Geometrical isomerism and optical isomerism in co-ordination
                 compounds for CN = 4 and CN = 6.
   1.5 IUPAC nomenclature of co-ordination compounds,
   1.6 Valence bond theory of transition metal complexes.
        A .Introduction
        B. Postulates of VBT/ basic concepts of VBT
        C. Role of transition metal in the formation of complex
        D. Stepwise process of formation of complex : Salient featers
        E. Applications : High spin and low spin complexes w.r.t. CN = 4 and CN = 6.
        F. Limitations of Valence bond theory.

2. Chelation   **(07)**
   2.1 A brief introduction w.r.t. ligand, chelating agent, chelation and metal chelate.
   2.2 Structural requirements of chelate formation.
   2.3 Difference between metal chelate and metal complex.
   2.4 Classification of chelating agents (with specific illustrations of bidentate
       chelating agent).
   2.5 Applications of chelation w.r.t. chelating agents : EDTA and DMG.

UNIT-II   **Credits: 1.47   Contact Hrs: 22**

3. Acids and Bases   **(07)**
   3.1 Lewis Concept : A.Definition, B.classification,C. merits and D.demerits.
   3.2 Hard and soft acids and bases (HSAB) :
          A. Classification of acids and bases as hard and soft,
          B. Pearson's HSAB concept,
          C. Acid-Base strength and hardness-softness,
          D. Applications and limitations of HSAB principle.

4. Study of d-block elements   **(15)**
   5.1. Introduction,
   5.2. Position of d-block elements in periodic table,
   5.3.Names & electronic configuration of 1st, 2nd & 3rd three transition series.
   5.4. General Characteristics of 3 d-block elements w.r.t. –
         a) oxidation state b) colour c) Magenetic behavior (spin only formula)
         d) catalytic properties   and   e) tendency to form complexes.

5.5. Comparison of 1st transition series with 2nd & 3rd transition series w.r.t. –
        a) electronic configuration   b) reactivity   c) stability of oxidation state
        d) magnetic behavior and   e) stability of complexes (Brief account only)

Reference Books :

1.   Concise Inorganic Chemistry by J.D. Lee ELBS 4th & 5th Edn.

2.   Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.

3.   Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.

4.   Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)

5.   Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)

6.   Inorganic Chemistry by Agrawal.

7.   Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.

8.   Selected topics in Inorganic Chemistry : Madan, Malik Tuli, S. Chand & Company.

9.   Vogel's Text Book of Quantitative Inorganic Analysis–Bassett, Denny, Jeffery Mendham.

10.   Basic concepts of Analytical Chemistry by S.M. Khopkar.

Semester-IV
Paper-VII- Physical Chemistry

Total Credits : 3
(45 Contact hrs.)

UNIT-I   **Credits: 1.87**   **Contact Hrs: 28**

1. Electrochemistry :   **(18)**
1.1. Introduction, conduction of electricity, Types of conductors : electronic and electrolytic.
1.2. Explanation of terms : Conductance, Specific resistance, specific conductance, Equivalent conductance, Molecular conductance.
1.3. Variation of specific and equivalent conductance with concentration, Equivalent conductance at infinite dilution. (Mention Onsager equation, $\lambda_v = \lambda_\infty - b\sqrt{c}$ from graph)
1.4. Migration of ions, Hittorf's rule, Transport number, Determination of transport number by moving boundary method, factors influencing transport number: Nature of electrolyte, concentration, temperature, complex formation and Degree of hydration.
1.5. Kohlrausch law, Applications of Kohlrausch law :
     i.   Determination of relationship between ionic conductance, ionic mobility and transport number.
     ii.   Determination of equivalent conductance at infinite dilution of weak electrolytes.
     iii.   Determination of degree of dissociation of weak electrolyte.
     iv.   Determination of ionic product of water.
     v.   Determination of solubility of sparingly soluble salts.
1.6. Numerical problems.

2. Thermodynamics   **(10)**
2.1. Introduction, concept of entropy, Entropy as a state function: Definition, mathematical expression, unit, physical significance of entropy.
2.2. Entropy changes for reversible and irreversible processes in isolated systems.
2.3. Entropy changes for an ideal gas as a function of V and T and as a function of P and T.
2.4. Entropy change in mixing of gases.
2.5. Entropy change in physical transformations :
     i.   Fusion of a solid.
     ii.   Vaporization of a liquid.
     iii.   Transition from one crystalline form to another.
2.6. Third law of thermodynamics, Absolute entropy and Evaluation of absolute entropy, use of absolute entropies: Determination of entropy changes in chemical reactions.
2.7. Numerical problems.

UNIT-II   **Credits: 1.13**   **Contact Hrs: 17**

3. The Solid State   **(10)**
3.1. Introduction, space lattice, lattice sites, lattice planes, Unit Cell.
3.2. Laws of crystallography :
     i.   Law of constancy of interfacial angles.
     ii.   Law of rational indices
     iii.   Law of crystal symmetry.
3.3. Weiss indices and Miller indices.

3.4. Cubic lattice and types of cubic lattice, planes or faces of a simple cubic system, spacings of lattice planes.
3.5. Diffraction of X-rays, Derivation of Bragg's equation.
3.6. Determination of crystal structure of NaCl and KCl on the basis of Bragg's equation.
3.7. Numerical problems.

4. **Distribution Law** (07)
   4.1. Introduction
   4.2. Nernst distribution law, its limitations and modification with respect to association and dissociation of solute in one of the solvents
   4.3. Applications of distribution law in
      i.   Process of extraction (derivation expect)
      ii. Determination of solubility
      iii. Distribution indicators
      iv. Determination of molecular weight
   4.4. Numerical problems expected

List of Reference Books :

1) Elements of Physical Chemistry : S. Glasstone and D. Lewis (D.Van Nostrand Co. Inc)

2) Physical Chemistry : W.J. Moore (Orient Longman)

3) Principles of Physical Chemistry : Maron & Prutton (Oxford IVth Edn.)

4) Chemistry Principle & Applications : P.W. Atkins, M.J. Clugsto, M.J. Fiazer, R.A.Y. Jone (Longman)

5) Physical Chemistry : G.M. Barrow (Tata Mc-Graw Hill)

6) Essentials of Physical Chemistry : B.S. Bahl & G.D. Tuli (S. Chand)

7) Physical Chemistry: Daniels – Alberty.

8) Principles of Physical Chemistry : Puri – Sharma (S. Nagin)

9) Basic Chemical Thermodynamics : V.V. Rao.

10) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)

11) Physical Chemistry: S. Glasstone.

12) Text book of Physical Chemistry – S. Glasstone (2nd Edn. Mac Millan)

13) Elements of Physical Chemistry – P. Atkins & J. Paula (Oxford IVth Edn.)

14) Principles of Physical Chemistry : B. R. Puri, L. R. Sharma and M. S. Pathania

15) Electrochemistry : S. Glasstone

Semester-IV
Paper- VIII- Analytical & Industrial Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

UNIT-I   **Credits: 1.33   Contact Hrs: 20**

1. Volumetric Analysis :   **(10)**

    1.1 Introduction, Terminology :- Titrant; Titrand, standard solution; Titration Indicator; Equivalence point; End point.Primary standard ,Secondary standard. Strength of solution, volumetric analysis & their types.

    1.2 Acid Base Titration

      i) Introduction

      ii) Theory of Acid-Base indicator :

            A) Colour change Interval

            B) Theories-Ostwald's theory & Quinoid theory,

      iii) Neutralization curve and choice of indicator for following titrations :

            A) Strong acid and Strong Base

            B) Strong Acid and Weak Base

            C) Weak Acid and Strong Base

    1.3 Complexometric titration :

            A)   General account,

            B)   Types of EDTA Titrations,

            C)   Metallochromic Indicator w.r.t. Eriochrome Black-T

2. Gravimetric Analysis: **(10)**

    2.1. Introduction, Terminology :-Gravimetric analysis, Saturation, Super-saturation, Sol, Gel, Coagulation or Flocculation, Coagulation or Flocculation value, Peptisation, Precipitation, Precipitate, Precipitant, Solubility, Aging or digestion, Ignition,

    2.2. General steps involved in gravimetry

    2.3. Precipitation – A) Physical nature of Precipitate: Gelatinous, Curdy and Crystalline.

                  B) Conditions of Precipitation

    2.4. Process of precipitation – A) Nucleation   B) Crystal growth   C) Digestion

    2.5. Co-precipitation and Post precipitation and their difference.

    2.6. Role of Organic precipitants in gravimetric analysis,

    2.7. Study of organic precipitants viz. A) DMG,   B) Aluminon, C) 8- Hydroxy quinoline.

    2.8. Advantages and disadvantages of organic precipitants.

UNIT-II Credits: 1.67 Contact Hrs: 25

3. Industrial heavy Chemicals   **(07)**

    3.1. Introduction

    3.2. Physicochemical Principles & manufacture of following heavy chemicals:

      i) Ammonia by Haber process

      ii) Sulphuric acid by contact process.

4.Metallurgy (08)

    4.1. Introduction: Terminology:- Metallurgy, Mineral, Ore, Gangue, Flux, Slag.

    4.2. Occurrence of metals: Types of ores

    4.3. Steps involved in metallurgical processes:

        A) Concentration of ores-

          I. Physical methods:

             a) Gravity separation method, b) Magnetic separation method, c) Froth flotation process.

          II. Chemical Methods:

             a) Calcination b) Roasting

        B) Reduction- i) Chemical methods of reduction

                ii) Electrolytic reduction method for e.g. Aluminium and copper

5. Iron and Steel (10)

    5.1 Occurrence of Iron

    5.2 Extraction of Iron: Blast furnace

    5.3 Types of Iron

    5.4 Steel-

        A) Definition

        B) Types of Steel

        C) Manufacture of Steel: a) Bessemer process b) L. D. process

        D) Heat treatment on Steel

List of Reference Books :

1. Concise Inorganic Chemistry by J.D. Lee ELBS 4th & 5th Edn.

2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.

3. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)

4. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)

5. Inorganic Chemistry by G.S. Manku Tata Mc. Graw Hill.

6. Inorganic Chemistry by Agrawal.

7. Industrial Chemistry by B.K. Sharma.

8. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.

9. Text book of Quantitative Inorganic Analysis by A.I. Vogel.

10. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.

11. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Laboratory Course (Practicals) Chemistry

University practical Examination : 140 marks

Internal practical Examination : 60 marks
_____

Total 200 Marks = Credits : 4

B.Sc.II-Chemistry practical Exaimination-pattern
Mark Distribution

* University Examination : (Two Day Exam)	Expt	Journal	Oral	Total
Q.1: Physical Chemistry Experiment	35	5	5	45
Q.2 : Inorganic Chemistry Experiment	40	5	5	50
Q.3 : Organic Chemistry Experiment	35	5	5	45

* Internal Examination :
Practical paper has 60 marks for Internal Examination.
There will be **three** practicals of 20 marks each.
1. Physical Chemistry Expt : 20 marks
2. Inorganic Chemistry Expt : 20 marks
3. Organic Chemistry Expt : 20 marks

Note : i) Use of Electronic / Single pan balance / Digital balance is allowed.
ii) Use of scientific calculator is allowed.
iii) Use S.I. Units wherever possible.

Laboratory Course Physical Chemistry

A) **Instrumental**
  1. Viscosity : To determine the percentage composition of a given liquid mixture by viscosity method. (Density data be given)
  2. Refractometry : To determine the specific and molar refractions of benzene, tolyene and xylene by Abbe's refractometer and hence determine the refraction of $-CH_2$ group. (Densities should be determined by the students.)
  3. Polarimetry : To determine the specific rotation and find unknown concentration of sugar solution.
  4. Conductometry : (any two)
     i. To determine degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductometrically.
     ii. To determine the normality of the given strong acid by titrating it aginst strong alkali conductometrically.
     iii. To determine the equivalent conductance at infinite dilution of strong electrolyte at five different dilutions conductometrically. (e.g. any one from KCl, NaCl, KNO_3 and HCl) and verify Onsager equation.

B) **Non-Instrumental**

  1. **Chemical Kinetics (ANY THREE)**

     i. To study the hydrolysis of methyl acetate in presence of HCl and H_2SO_4 and to determine the relative strong of acids.
     ii. To study the effect of acid strength (0.5M and 0.25M HCl) on hydrolysis of an ester.
     iii. To study the reaction between $K_2S_2O_8$ and KI (unequal concentration)
     iv. To study the reaction between $KBrO_3$ and KI (equal concentrations)

  2. **Partition coefficient**
     To determine partition coefficient of benzoic acid between water and benzene

Reference Books :

  1. Experimental Physical Chemistry by A. Findlay Longman.

  2. Experiments in Physical Chemistry by R.C. Das & B. Behra. Tata Mc Graw Hill.

  3. Advanced Experimental Chemistry Vol. I Physical by J.N. Gurtu and R. Kapoor S. Chand & Co.

  4. Experiments in Physical Chemistry by J.C. Ghosh, Bharati Bhavan.

  5. Practical book of Physical Chemistry – by Nadkarni Kothari Lawande. Bombay Popular Prakashan.

  6. Systematic Experimental Physical Chemistry – by S.W. Rajbhoj, Chondhekar. Anjali Publication.

  7. Practical Physical Chemistry – by B.D. Khosala & V.C. Garg R. Chand & Sons.

  8. Experiments in Chemistry by D.V. Jagirdar.

Practical Course Inorganic Chemistry

1. **Gravimetric Analysis :**

   i.   Gravimetric estimation of Fe as Fe_2O_3 from a solution containing ferrous ammonium sulphate and free sulphuric acid.
   ii. Gravimetric estimation of Ba as $BaSO_4$ from a solution containing barium chloride and free hydrochloric acid.

2. **Titrimetric Analysis :** Calibration of burette, pipette and volumetric flask.

   i.   Fertilizer analysis : To determine the percentage of nitrogen present in a given sample of nitrogenous fertilizer.
   ii. Quality control – To determine percentage purity of soda ash in the given sample.
   iii. Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.
   iv. To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.

3. **Inorganic Preparations :**

   i.   Ferrous Ammonium Sulphate (Mohr's salt)
   ii. Tetrammine Copper (II) sulphate

4. **Semi-micro Qualitative Analysis :**

   Cations : Cu^{++}, Al^{+++}, Fe^{+++}, Mn^{++}, Zn^{++}, Ni^{++}, Ba^{++}, Ca^{++}, Mg^{++}, NH_4^+, K^+

   Anions : Cl^-, Br^-, I^-, SO_4^{2-}, NO_3^-, CO_3^{2-} At least **SIX** mixtures to be completed.

Reference Books :

1. Quantative Inorganic Chemistry – A.I. Vogel.
2. Practical Chemistry – Physical – Inorganic – Organic and Vice-voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.
3. Inorganic Qualitative Analysis – A.I. Vogel.
4. Basic Concepts in Analytical Chemistry – S.M. Khopkar.
5. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.

Laboratory Course Organic Chemistry

A) Organic Qualitative Analysis :

Identification of at least **Eight organic compounds** with reactions including two from acids, two from phenols, two from bases and two from neutrals.

- **Acids** : succinic acid, phthalic acid, salicylic acid, aspirin
- **Phenols** : α– naphthol, o-nitrophenol, p-nitrophenol
- **Bases** : o-, m-, and p-nitroanilines N, N-dimethylaniline
- **Neutral** : urea, acetanilide, carbontetrachloride, bromobenzene, methylacetate, nitrobenzene, naphthalene, anthracene, acetophenone, ethylmethyl ketone.

Note : A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the determination of elements and functional group.

1) Preliminary tests and physical examination
2) Determination of type
3) Determination of physical constant
4) Detection of elements
5) Determination of functional group
6) A search into the literature
7) Special test if any
8) Summary
9) Result.

B) Organic Quantitative Analysis :

   i. **Estimations (Any Two)**
     1. Estimation of ester
     2. Etimation of acetone
     3. Estimation of ibuprofen from ibuprofen tablet

   ii. **Organic Preparations (Any Three)**
     1. Preparation of phthalimide from phthalic anhydride.
     2. Preparation of p-bromoacetanilide from acetanilide.
     3. Preparation of m-dinitrobenzene from nitrobenzene using $NaNO_2$ and conc. H_2SO_4.
     4. Preparation of acetanilide from aniline using acetic acid and anhydrous zinc chloride.
     5. Preparation of p-nitroethylbenzoate from p-nitrobenzoic acid

Reference Books :
1. Practical Organic Chemistry by A.I. Vogel.
2. Hand book of Organic qualitative analysis by H.T. Clarke.
3. A laboratory Hand Book of Organic qualitative analysis and separation by V.S. Kulkarni. Dastane Ramchandra & Co.
4. Practical Organic Chemistry by F.G. Mann and B.C. Saunders. Low – priced Text Book. ELBS. Longman.
5. Experiments in General Chemistry by C.N.R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.
6. Advanced Practical Organic Chemistry by N.K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V.K. Ahluwalia, Sunita Dhingra. University Press. Distributor-Orient Longman Ltd.
8. Practical Chemistry – Physical – Inorganic – Organic and Viva – voce by Balwant Rai Satija. Allied Publishers Private Limited.
9. Experimental organic chemistry by J. R. Norris, published by Sarup and sons, Delhi
10. Advanced practical chemistry by J. Singh, L. D. S. Yadav, R. K. P. singgh, I. R. Siddiqui et.al, Pragati prakashan.

****

SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science

CBCS Pattern Syllabus

B.Sc.II (Sem-III&IV)

Mathematics

With effect from June-2017

B.Sc.II - Mathematics :

Preamble :
B.Sc.II Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology. Also logical development of the various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things. In the theory courses of algebra, analysis and differential calculus and differential equations various deductions of the theorems, corollaries and lemmas will be acquired by the students. Change is the universal truth of the nature and it can be presented with the help of dependent and independent variables in the form of functions and differential equations. So our aim is that students should learn various techniques to find solutions of differential equations. Students who opted S.Y.B.Sc. Mathematics have to complete 4 theory courses 2 each semester, two practicals entitled (Numerical Techniques in Laboratory) NTL-II courses (Annual). In the practical course of 200 marks students exercise the problem solving techniques for practical course I and II. The details are mentioned in the syllabus..

Objectives of the course : The aim of the course is to generate intelligent and skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To inculcate conceptual understanding in basic phenomena, statements, theorems and development of appropriate problem solving skills suitable for applications and abstract algebraic techniques, sufficient logical connectivity is provided.

Following are the objectives-
i. To design the syllabus with specific focus on key Learning Areas.
ii. To equip student with necessary fundamental concepts and knowledge base.
iii. To develop specific problem solving skills.
iv. To impart training on abstract concepts, analysis, deductive tecchniques.
v.   To prepare students for demonstrating the acquired knowledge.
vi. To encourage student to develop skills for developing innovative ideas.

Solapur University, Solapur
Faculty of Science
Syllabus for B.Sc.II-Mathematics
Semester System
Choice Based Credit System (CBCS) Pattern
To be implemented from Academic Year 2017-18

1. **Course Structure:**

Sr. No	Semester	Paper No.	Title	No. of Lectures	Credit Point	Total Marks
1.	Semester-III	V	Differential Calculus	45	3	100
		VI	Real analysis	45	3	100
2.	Semester-IV	VII	Differential Equations	45	3	100
		VIII	Abstract algebra-I	45	3	100
3.	Semester III and IV (Annual)		Numerical Techniques in Laboratory[NTL-II A & B] Practical Course (Annual)		8	200
			Total Marks		20	600

2. **Distribution of each Theory paper (Marks 100)**
     University Assessment (UA) : 70 Marks
     College Assessment (CA)   : 30 Marks
   Scheme of College Assessment
     1. Unit Test   : 15 Marks
     2. Home Assignment   : 15 Marks

3. **Distribution of Practical Marks (200)**
   Practical examination will be at the end of fourth semester. The candidate has to perform four practicals, one from each group.

   A. University Practical Examination (140) Marks: (UA)
       a) Problems from paper-V   :   30
       b) Problems from paper-VI   :   30
       c) Problems from paper-VII   :   30
       d) Problems from paper-VIII   :   30
       e) Journal   :   20

   B. Practical : Internal Continuous Assessment (60 marks)
       Scheme of Marking: **30 Marks:** Internal Test on any four practicals,
                           30 Marks: Home assignment/oral/Seminars/Conference
                                         /Industrial Visit/Group Discussion/Viva, etc.

Semester -III
Paper –V (Differential Calculus)

Unit-1. Tangents and Normals:
Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, subtangent, subnormal at any point of a curve, Pedal equations or p, r equations (Cartesian form), Angle between radius vector and tangent, Length of the perpendicular from pole to the tangent, Length of polar subtangent and polar sub-normal, Pedal equations (polar form), Derivative of length of an arc(Cartesian form), Derivative of arc length(Polar Formula) and Other formulae. **[13]**

Unit-2. Curvature :
Definition of Curvature ,Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. **[12]**

Unit-3. Jacobians:
Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). **[08]**

Unit- 4. Maxima and Minima :
Definiton of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values(Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives. Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers of two variables. **[12]**

Recommended Book(Scope of Syllabus):
Differential Calculus by *Shanti Narayan and P.K.Mittal S.Chand Publication Revised Edition 2005.*

Unit 1 :7.2,7.3,7.4,7.5,7.6,7.7,7.8,7.9,7.10,7.11,7.12,7.13.
Unit 2 :14.1,14.2,14.3.
Unit 3 :12.1,12.2,12.3,12.4
Unit 4 : 9.1,9.2,9.3,9.4, 9.6.(Examples restricted upto two variables only)

Reference Books
1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus , Nirali Prakashan Pune.
2. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
3. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow
4. P. N. Wartikar and J. N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
5. Tom M. Apostol, Calculus Vol I and II, Wiley Publication.

Paper-VI Real Analysis
Unit -1 : Real Numbers **[15]**
1. Introduction
2.Field Structure and Order Structure
3. Bounded and Unbounded Sets: Supremum, Infimum
4 Completeness in the Set of Real Numbers
5. Absolute Value of a Real Number

Unit –2 : Real Sequences [15]
1. Sequences
2. Limit Points of a Sequence
3. Limit Inferior and Superior
4. Convergent Sequnces
5. Nonconvergent Sequences(Definitions)
6. Cauchy's General Principle of Convergence
7. Algebra of Sequences
8. Some Important Theorems
9. Monotonic Sequences

Unit– 3: Infinite Series [15]
1. Introduction
2. Positive Term Series
3. Comparison Tests for Positive Term Series
4. Cauchy's Root Test
5. D'Alembert's Ratio Test
6. Raabe's Test (Only Statement and Examples)
7. Logarithmic Test(Only Statement and Examples)

Recommended Book (Scope of Syllabus):
Mathematical Analysis by S. C. Malik and Savita Arora(Third Revised Edition- 2008)
New Age International Publishers.
<div align="center">

Real Analysis
</div>

Unit–1 : (**Real Numbers**) Art: 1 to 5

Unit –2 : (**Real Sequences**) Art: 1 to 9

Unit–3: (**Infinite Series**) Art: 1 to 9

 Reference books
1.   Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. ,
   B. Sc. – II (Mathematics) Semester-III, Paper –VI Real Analysis, Nirali Prakashan Pune.
 2.   A first course in mathematical analysis by D. Somasundaram & B.Choudhary Narosa
   Publishing House.
3. Real Analysis by R.R. Goldberg.
 4.Principles of Mathematical analysis by Rudin W. McGraw-Hill, NewYork .
5.A Course of Mathematical Analysis by Shanti Narayan, S.Chand and Company New Delhi.

Semester – IV
Paper – VII Differential Equations
Unit 1:- Differential Equations of the first order and of degree higher than the first :
Equations that can be resolved into factors of the first degree, Equations solvable for x,
Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form.   [10]
Unit 2 : Linear Equations of the second order :
General form of the   second order linear equation, Complete solution when one integral
belonging to complementary function is known ,Rules of getting an integral belonging to
complementary function , Removal of the First order Derivative. Transformation of the
linear equation of second order by Changing the independent variable.   [15]
Unit 3 : Homogeneous linear equations :
Homogeneous linear equations, Working rule for finding the solution, Equations reducible to
Homogeneous form.   [10]

Unit 4. Simultaneous Equations & Total Differential Equations:
Nature of the solution of simultaneous equations, Rules of solving the Equation, Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness , Method of Solving the Equation.   **[10]**
Recommended Book :
Differential Equation :
Ordinary and Partial Differential Equations :by *M.D.Raisinghania,S.Chand*
Co.Ltd.Ramanagar,New Delhi-110055(Edition2002)
Unit 1 (Part I) :6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 6.10, 6.11, 6.12.
Unit 2 (Part I)   :5.1, 5.2, 5.3, 5.6, 5.7.
Unit 3 (Part II) :4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11.
Unit 4 (Part II) :5.1,5.2, 5.4,5.5,5.6,5.7.
Unit 5 (Part II) :6.2,6.3,6.4,6.5,6.6,6.7.
   1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VII Differential Equation , Nirali Prakashan Pune.
   2. Differential Equation by Murrey.
   3. Differential Equation by Diwan and Agashe
   4. Differential Equation by Sharma-Gupta, Krishna Prakashan Media (Pvt.) Ltd, Meerut

<div align="center">

Paper –VIII Abstract Algebra

</div>

Unit-1: Introduction to Groups   **[10]**
      Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.
Unit -2: Equivalence, Congruence, Divisibilty   **[10]**
      Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.
Unit-3: Groups   **[10]**
      Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.
Unit-4: Group Homomorphism   **[10]**
      Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.
Recommended books (Scope of Syllabus):
Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition
Unit – 1 : Chapter-II: Art. 5,6,7,8
Unit – 2 : Chapter-III: Art. 9,10,11,12
Unit – 3 : Chapter-IV : Art. 14,15,16,17,18,19,20 Ch- V :21,22,23
Unit – 4 : Ch- V :21,22,23
Reference Books:
1.   Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VIII: Abstract Algebra -I, Nirali Prakashan Pune.
2. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education 7th edition.
3.   University Algebra N.S. Gopalkrishnan.
4. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
5. Fundamentals of Abstract Algebra D. S. Malik & N. Mordeson & M. K. Sen Mc. Graw Hill International Edition.
6. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House   Pvt. Ltd.

Numerical Technique in Laboratory -II [NTL - II]
(Differential Calculus , Real Analysis, Differential Equation, Abstract Algebra)

[NTL – IIA]

Assignment No.1: Tangents and Normals

Assignment No.2: Curvature

Assignment No.3 : Jacobians

Assignment No. 4 : Maxima and Minima

Assignment No. 5 : Real Numbers

Assignment No. 6 : Open Sets, Closed Sets and Countable Sets

Assignment No. 7: Real Sequences

Assignment No. 8: Infinite Series

[NTL – IIB]

Assignment No. 9: Differential Equations of the first order and of degree higher than the first .

Assignment No. 10: Linear Equations of the second order (Part –I)

Assignment No. 11: Linear Equations of the second order & Homogeneous linear equations (Part –II)

Assignment No.12: Simultaneous Equations & Total Differential Equations

Assignment No.13: Introduction to Groups

Assignment No.14: Equivalence, Congruence, Divisibilty

Assignment No.15: Groups

Assignment No.16: Group Homomorphism

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-III :Differential Calculus	Paper-V :Differential Calculus
2)	Paper-IV: Real Analysis	Paper-VI: Real Analysis
3)	Paper-V: Differential Equation	Paper-VII: Differential Equation
4)	Paper-VI : Abstract Algebra - I	Paper-VIII : Abstract Algebra - I
	Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual)	Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: PHYSICS

Name of the Course: B.Sc. II (Sem–III & IV)

(Syllabus to be implemented from w.e.f. June 2020)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II
Core Subject: - Physics
(New CBCS Semester Pattern) syllabus w e f June 2020)

1. There will be four theory papers (Paper V and Paper VI for semester III and Paper VII and Paper VIII for semester IV) of 50 marks and 2 credits each. Annual practical examination will be of 100 marks and 4 credits. Total marks for physics as a core subject will be 300 [200 marks (8 credits) for theory and 100 marks (4 credits) for practical). Assessment system for both theory and practical will be of 80 % UA (University Assessment) and 20 % CA (College Assessment).

2. There shall be three periods per paper per week for theory and eight periods per week per practical batch of 16 (Sixteen) students each.

3. Duration of theory examination for each paper of 40 marks will be 2 hours each and that for the practical examination will be two days means 4 sessions of 3 hours each.

4. The theory examination of paper V and VI will be held at the end of semester III.

5. The theory examination of paper VII and VIII will be held at end of semester IV.

6. The practical examination of the both semester will be held at the end of semester IV. Every student will have to perform four experiments i.e. any one from each group.

7. Report of 20 % CA (5 Marks for internal examination and 5 Marks for assignment of each paper of every semester) of theory and practical (5 Marks for each group at the end of second term of B Sc Part II before commencement of University examination of fourth semester) has to submit by the College in the University office.

Titles of Physics as a core subject with their paper codes

Semester – III

Paper – V - General Physics and Sound.   - 50 (80 % UA + 20 % CA) Marks

Paper –VI - Electronics   - 50 (80 % UA + 20 % CA) Marks

Semester – IV

Paper – VII - Optics   - 50 (80 % UA + 20 % CA) Marks

Paper – VIII - Modern Physics   - 50 (80 % UA + 20 % CA) Marks

Annual Practical at the end of Fourth semester   100 (80 % UA + 20 % CA) Marks

[UA (University Assessment): Four groups each of 15 marks, 10 Marks for Journal, 10 Marks for educanctional trip / industrial visit/ seminar or conference attendance/ project report; CA (College Assessment): 20 Marks]

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper: V General Physics, Heat and Sound	Paper: V General Physics and Sound
2)	Paper: VI Electronics	Paper: VI Electronics
3)	Paper: VII Optics	Paper: VII Optics
4)	Paper: VIII Modern Physics	Paper: VIII Modern Physics

Semester III

Physics Paper V - General Physics and Sound

(50 Marks and 2 Credits)

1. **Vectors:**   [6 hr]

    1.1 Scalar and vector triple product

    1.2 Scalar and vector fields

    1.3 Del operator

    1.4 Gradient of a scalar

    1.5 Divergence of a vector and their physical significance

    1.6 curl of vector and their physical significance

2. **Precessional Motion: -**   [6 hr]

    2.1 Precession
    2.2 Gyroscope
    2.3 Nutation
    2.4 Lanchester's rules
    2.5 Gyrostatic pendulum

    2.6 Motion of rolling disc

    2.7 Gyroscopic applications in brief

3 . **Elasticity: -**   [6 hr]

    3.1 Bending of a beam

    3.2 Bending moment

    3.3 Cantilever

    3.4 Centrally loaded beam

    3.5 Y and η by Searle's method

4. **Viscosity: -**   [6 hr]

    4.1 Motion in a viscous medium- Stoke's law

    4.2 Viscosity of liquid by rotating cylinder method

    4.3 Searle's viscometer

    4.4 Ostwald's viscometer

    4.5 Viscosity of gasses – Rankin's mehod

5. Sound: [6 hr]

   5.1 Acoustic transducers i) Pressure microphone ii) Moving coil loudspeaker

   5.2 Acoustics and its affecting factors

   5.3 Reverberation time and its optimum value

   5.4 Requirements of good acoustics

   5.5 Sabine's formula

   Reference Books:

1. Elements of matter – D.S. Mathur
2. Physics for degree students – C. L. Arora, P. S. Hemne.
3. Text book of properties of matter – N. S. Khare , S. K. Kumar
4. Text book of Sound – Brijlal and Subramanyam.
5. Sound – Khanna and Bedi
6. Sound – Wood A. B.
7. Mathematical Physics – Rajput & Gupta
8. Engineering Physics Part I – Selladurai PHI Learning Pvt. Ltd, New Delhi

Semester III

Physics Paper VI - Electronics - (50 Marks and 2 Credits)

1. **Transistor amplifier :** [8 hr]

    1.1 Transistor biasing: voltage divider bias

    1.2 Two stage R-C coupled transistor amplifier

    1.3 Frequency response curve of an amplifier

    1.4 Feedback

    1.5 Effect of positive and negative feedback on the frequency response curve

    1.6 Differential amplifier

    1.7 Modes of operation

    1.8 Common mode and differential mode signals

    1.9 Comparison between normal amplifier and differential amplifier

2. **Oscillator :** [6hr]

    2.1 Types of waveforms

    2.2 Oscillations from tank circuit

    2.3 Barkhausen's criterion for sustained oscillations

    2.4 Concept of AF and RF Oscillator

    2.5 Phase shift oscillator

    2.6 Colpitt's oscillator

    2.7 Hartley oscillator,

    2.8 Crystal Oscillator (qualitative treatment only)

3. **Unipolar Devices:** [4 hr]

    3.1 FET: Construction, operation and characteristics

    3.2 Application of FET as VVR

    3.3 UJT: Construction, operation and characteristics

    3.4 UJT as voltage sweep generator

4. **Electronic Instruments:** [6 hr]

    4.1 Principle, Construction and working of CRT

    4.2 Block diagram of CRO

    4.3 Uses of CRO

    4.4 Digital Multimeter (DMM) and its applications

5 . **Regulated power supply** [6hr]

5.1 Regulated power supply (with block diagram) and its need

5.2 Line and load regulation

5.3 Transistor Series power supply

5.4 IC voltage regulators

5.5 Fixed output voltage regulators (using IC 78XX and 79XX)

5.6 Dual power supply using 3 pin IC

REFERANCE BOOKS:

1. Principles of electronics - V.K. Mehta

2. Electronics principles - (3rd and 6th edition) - Malvino.

3. Op-Amps and linear integrated circuits (4th edition) - Ramakant Gayakwad.

4. A Text book of Electrical Technology Vol. IV – B. L. Theraja, A.K. Theraja

Semester IV

Physics Paper VII - Optics - (50 Marks and 2 Credits)

1. Cardinal points: [6hr]

1.1 Lagrange's equation
1.2 Cardinal points of optical system
1.3 Graphical construction of image using cardinal points &Newton's formula

1.4 Relation between focal lengths for any optical system

1.5 Relations between lateral, axial and angular magnifications
1.6 Thick lens (introduction)
1.7 combination of two thin lenses

2. Interference of light: [6hr]

2.1 Michelson's interferometer

2.2 Applications of Michelson's interferometer to measure i) wavelength of light

ii) Difference in wavelengths and iii) Refractive index of thin film

2.3 An Etalon (Introduction Only)

2.4 Construction and working of Fabry Perot interferometer

2.5 Superiority of F.P. interferometer over Michelson's interferometer

3 . Diffraction of light & resolving power: [7hr]

3.1 Fresnel's half period zones

3.2 Explanation of rectilinear propagation of light

3.3 Zone plate

3.4 Fresnel's diffraction at straight edge

3.5 Geometrical and spectral resolution

3.6 Distinction between magnification and resolution

3.7 Rayleigh's criterion for the limit of resolution and modified Rayleigh's criteria

3.8 Modified Rayleigh's criterion

3.9 R.P. of plane diffraction grating

4.0 R. P. of prism

4 Polarization: [7hr]

4.1Concept of Polarization

4.2 Double refraction and

4.3 Huygen's explanation of double refraction through uni-axial crystals

4.4Nicol's prism

4.4 optical rotation

4.5 Optical Activity and Specific Rotation

4.6 Laws of rotation and plane of polarization

4.7 Polaroid and their Use to Polarization

4.8 Applications   a) Polarimeter

b) Liquid crystal Displays (LCDs)

5. Optical Fibers: **[4hr]**

5.1 Structure of fibers

5.2 Types of optical fiber

5.3 Numerical aperture

5.4 Pulse dispersion in step index fiber

5.5 Fiber optic communication system

5.6 Advantages of optical fiber

Reference Books:

1. Optics and Spectroscopy – R. Murigation
2. Text book of optics (new edition) – Brijlal and Subramanyam
3. Optics (Second edition) – Ajay Ghatak
4. Geometrical and Physical optics – D. S. Mathur
5. Fundamental of optics – Jenkins and white
6. Optics and Atomic physics – Satya Prakash
7. Engineering Physics – S. Selladurai
8. Optical Communication - Jain, Mathur (Kanpur IIT)

Semester IV

Physics Paper VIII - Modern physics - (50 Marks and 2 Credits)

1. Theory of relativity: [9 hr]

1.1 Inertial frame of reference

1.2 Galilean transformation

1.3 Invariance of laws of mechanics under Galilean transformation

1.4 Ether hypothesis

1.5 Michelson-Morley experiment

1.6 Einstein's postulates of the special theory of relativity

1.7 Lorentz transformation

1.8 Variation of length with velocity

1.9 Variation of time with velocity

1.10   Velocity addition theorem

1.11   Variation of mass with velocity

1.12   Mass energy relation

1.13   Twin paradox

2. Matter waves: [6 hr]

2.1 De Broglie's hypothesis of matter waves

2.2 De Broglie's wavelength

2.3 Particle velocity, group velocity , phase velocity & their interrelationship

2.4 Properties of matter waves

2.5 Bohr's quantum condition on the basis of matter wave hypothesis

2.6 Heisenberg's uncertainty principle and its illustrations

3. Vector Atom model: [8 hr]

3.1 Space quantization

3.2 Spin hypothesis

3.3 Stern-Gerlache experiment

3.4 Quantum numbers associated with vector atom model

3.5 Pauli's exclusion principle

3.6 Spin orbit coupling

3.7 Hund's rule

3.8 Total angular momentum

3.9 L-S coupling

3.10   j-j coupling

3.11   Zeeman effect

3.12   Normal and anomalous Zeeman effect

3.13   Debye's explanation of normal Zeeman effect

4. Compton effect: [3 hr]
4.1 Compton Effect

4.2 Expression for change in wavelength for scattered photon

4.3 Experimental verification of Compton effect

5. Nuclear Energy sources: [4 hr]
5.1 Neutron induced nuclear reaction

5.2 Nuclear fission

5.3 Energy released in fission

5.4 Chain reaction (Atomic Bomb)

5.5 Nuclear reactor

5.6 Atomic energy in India

Reference Books:

1. Introduction to special relativity - Robert Reshnik

2. Perspective of Modern Physics – Arther Beiser

3. Atomic and nuclear Physics – Gupta and Ghosh 2nd Edition

4. Quantum Mechanics – Singh, Bagade, Kamal Singh, Chand and Co.

5. Introduction to Atomic and Nuclear Physics – H. Semat and Albrought

6. Atomic Physics - Rajam

7. Modern Physics – S. H. Patil (IIT)

8. Nuclear Physics -Kaplan

B.Sc. II Physics Practical
(100 Marks and 4 Credits)

(With effect from - June 2020)

List of Experiments

Group I (General Physics, Heat and Sound)

1. Young's Modulus (Y) by bending of the centrally loaded beam.
2. Y or η of the material in the form of wire by Searle's method.
3. Young's modulus (Y) by Vibration of a bar.
4. Kater's Pendulum.
5. Surface tension by Quinke's method.
6. Viscosity of liquid by Searle's method.
7. Surface Tension of liquid by capillary rise method.
8. Thermal conductivity of rubber tube.
9. Velocity of sound by Kundt's tube
10. Velocity of sound by resonating bottle.

Group II (Electronics)

1. Transistor series voltage regulator.
2. Biasing network.
3. Use of C.R.O. for measurement of AC, DC voltage and frequency.
4. Characteristics of FET.
5. UJT as voltage sweep generator.
6. Colpitt's oscillator.
7. Phase shift oscillator.
8. De Morgan's theorems.
9. Two stage RC coupled amplifier
10. Construction of half adder & full adder using gates

Group III (Optics)

1. Biprism : To determine the wavelength of monochromatic light
2. Goniometer : Equivalent focal length for different thick lenses.
3. Goniometer : Cardinal points
4. Determination of Cauchy's Constants
5. Double refracting prism
6. Optical activity of sugar solution (Polarimeter)
7. Diffraction at single slit
8. Resolving power of grating
9. Diffraction due to cylindrical obstacle.
10. Wedge shaped film: Measurement of thickness

Group IV (Electricity, Magnetism and Modern Physics):

1. Constants of B.G.
2. Comparison of Capacities by Deshotty's method.
3. Mutual Induction of two separate coils or ttransformer coils (Primary & Secondary)
4. Low resistance by Carry fosters method
5. High resistance by nearly equal deflection method
6. Solar cell characteristics to determine fill factor and efficiency
7. Impedance of LCR parallel circuit at resonating state
8. Sharpness of series resonance circuit
9. Study of Characteristics of G M tube and determination of its operating voltage, Platue length and slope etc
10. Verification of inverse square law for gamma rays

NB: At least eight experiments from each group are required to certify the journal. 10 Marks for certified journal should not be given in case of lost certificate&10 Marks for educational trip / industrial visit/ seminar or conference attendance/ project report. Such students may appear the practical examination of 80 marks with prior permission of his/her Principal. Examiner and Laboratory Supervisor will allow him / her only after submission of permission letter and lost certificate from his / her Principal.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Nature of Question Paper for choice based credit system (CBCS) Semester Pattern
• Faculty of Science •
(w. e. f. June 2020)

Time: - 2 hrs.   **Total Marks-40**

Instructions:

1. All questions are compulsory.
2. Draw **neat diagrams** and give **equations** wherever necessary.
3. Figures to the **right** indicate **full marks**.
4. Use of logarithmic table and calculator is allowed.

Q. No.1) Multiple choice questions   (08)

1) --
      a) b) c) d)
2)
3)
4)
5)
6)
7)
8)

Q.No.2) Answer any four of the following   (08)

i)
ii)
iii)
iv)
v)
vi)

Q.No.3 Write notes on any Two of the following   (08)

i
ii)
iii)

Q. No.4) Answer any Two of the following   (08)

i)
ii)
iii)

Q.No.5) Answer any one of the following   (08)
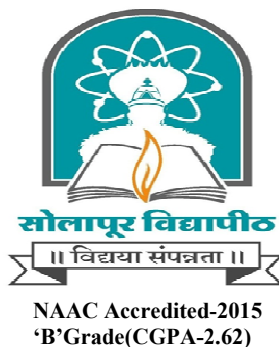
i)
ii)

NB: Minimum two numerical type sub questions must be asked in question number 1 and 2.
      One each from question number 3 and 4 must be of numerical type sub question.

Solapur University, Solapur

NAAC Accredited-2015
'B'Grade(CGPA-2.62)

B.Sc. Part- II ZOOLOGY

Semester III and IV

Choice Based Credit System (CBCS) Pattern
SYLLABUS
w.e.f. 2017-18

SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science
Choice Based Credit System (CBCS)
(W.e.f. 2017-18)

· **Title of the Course:** B.Sc. Part-II

• **Subject:** Zoology

• **Introduction:** This course provides a broad overview of Zoology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Zoology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

• **Objectives of the course:** The objectives of B. Sc. Zoology course are:

- To provide an intensive and in depth learning to the students in field of Zoology.

- Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world.

- To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students.

- To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

• **Advantages of the Course:** Zoology has tremendous job potential.

➢ The successful students will be able to establish research orgnizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc.

➢ Scientific Research Organizations.

➢ Universities in India & aboard

Solapur University, Solapur

Faculty of Science
Choice Based Credit System (CBCS)
(w.e.f.2017-18)
Structure for B. Sc-II

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :			**B.Sc.- II Semester - III**							
	Core	ZOOLOGY 1	Paper V- Animal Diversity -III	3	--	--	100	70	30	3
			Paper VI- Cell Science, Genetics, Biological Chemistry and Economic Zoology	3	--	--	100	70	30	3
	Core	Subject 2	Paper V	3	--	--	100	70	30	3
			Paper VI	3	--	--	100	70	30	3
	Core	Subject 3	Paper V	3	--	--	100	70	30	3
			Paper VI	3	--	--	100	70	30	3
Grand Total				18	--	--	600	420	180	18
Class :			**B.Sc.- II Semester - IV**							
	Ability Enhancement Course(AECC)	Environmental Science		4			100	70	30	4
	Core	ZOOLOGY 1	Paper VII- Animal Diversity -IV	3	--	--	100	70	30	3
			Paper VIII- Histology and Physiology	3	--	--	100	70	30	3
	Core	Subject 2	Paper VII	3	--	--	100	70	30	3
			Paper VIII	3	--	--	100	70	30	3
	Core	Subject 3	Paper VII	3	--	--	100	70	30	3
			Paper VIII	3	--	--	100	70	30	3
Total (Theory)				22	--	--	700	490	210	22
	Core	ZOOLOGY 1	Pr. II&III	--	--	8	200	140	60	8
	Core	Subject 2	Pr. II&III	--	--	8	200	140	60	8
	Core	Subject 3	Pr. II&III	--	--	8	200	140	60	8
Total (Practicals)						24	600	420	180	24
Grand Total				22		24	1300	910	390	46

General Guidelines for Choice Based Credit System (CBCS)

B.Sc. II - Details Course structure - w . e. f.   2017-18

1. The University follows Semester system

2. An academic year shall consist of two semesters

3. Each B.Sc. course shall consist of three years i.e. six semesters

4. Environmental Studies paper shall remain compulsory for B. Sc .Part- II students in IVth Sem.

4. B.Sc.Part-II shall consist of two semesters: Semester III and Semester IV.

In semester –III, there will be two theory papers of 100 marks for each subject. There shall be three optional science subjects. Similarly, in semester –IV there will be two theory papers of 100 marks for each subject. There shall be three optional science subjects and Environmental Studies paper compulsory for every student in semester IV.

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below. For B.Sc.Part II Sem III & IV the internal assessment will be based on Unit tests, Home assignment, viva, practicals, Project Work etc as given below. Practical course examination of 200 marks for each subject shall be conducted at the end of IVth semester. The practical examination of 200 marks shall also consist of 140 marks for University practical assessment and 60 marks for college internal assessment.

The process of evaluation for Environmental Studies shall be based on University theory examination of 70 marks and 30 marks internal assessment. The internal assessment for environmental studies shall be based on internal test/ home assignment/tutorial of 10 marks and project work for 20 marks.

For University practical examination out of two examiners, one examiner will be internal and another examiner will be External. Both examiners will be appointed by the University. The internal practical assessment shall be done as per scheme given below.

5. **Scheme of evaluation:**
     As per the norms of the grading system of evaluation, out of 100 Marks, the candidate has to appear for College internal assessment of 30 marks and external evaluation (University Assessment) of 70 marks. The respective B.O.S. may decide the nature of College internal Assessment after referring to the scheme given below or may be used as it is.

Semester - III:
Theory : (100 marks)
University Examination (70 Marks): No. of Theory papers: 2 Papers/Subject (Total 6 Papers)

Internal Continuous Assessment (30 Marks):

Scheme of Marking: 20 Marks: Internal Test
10 Marks: Home assignment/Tutorials/Seminars/ Group discussion/ Viva/Field visit/Industry visit.

Semester - IV: (100 marks)
Theory:
University Examination (70 Marks): No of Theory papers: 2 Papers/Subject (Total 6+1Papers)

Internal Continuous Assessment (30 Marks):
Scheme of Marking: 20 Marks: Internal Test
10 Marks: Home assignment/Tutorials/ Seminars/ Group discussion/ Viva/ Field visit/Industry visit.

Practical Examination:
University Examination (140 Marks): No of Practicals: 1 Practical /Subject (Total 3 Practicals)

Internal Continuous Assessment (60 Marks):
Scheme of Marking: 40 Marks: Internal Test on any four practicals, 20 Marks: Lab Journal/viva, attendance, attitude etc. For Environmental Studies there shall be theory examination of 70 marks (UA) and 30 marks (CA)   internal assessment. The internal assessment for environmental studies shall be   based   on   internal   test/   home assignment/tutorial of 10 marks and project work and report of 20 marks.

6. **Passing Standard**
The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secures less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper (subject) and shall be required to reappear for respective paper. A student who failed in University Examination (Theory) & passed in internal assessment of a same paper (subject) shall be given FC Grade. Such student will have to appear for University Examination only. A student who fails in Internal Assessment and passed in University examination (Theory) shall be given FR Grade. Such student will have to appear for both University examination as well as internal assessment. In case of Annual Pattern/Old Semester Pattern Students/candidates from the mark scheme the candidates shall appear for the same 70 marks paper of the external examination and his performance shall be scaled to 100 marks

  * **ATKT**
Candidate passed in all the papers except 4 (four) papers combined together of the semester I and Semester II of B.Sc. Part I examination shall be permitted to enter upon the course of Semester III of B.Sc.Part II

Solapur University, Solapur

Nature of Question Paper for Choice Based Credit System (CBCS) Semester Pattern, • Faculty of Science , B.Sc. II (w.e.f. 2017-18)

Time: - 3.0 hrs.   **Total Marks- 70**

Q. No.1) Multiple choice questions   (14)

1) ---
a)   b)   c)   d)
2)
3)
4)
5)
6)
7)
8)
9)
10)
11)
12)
13)
14)

Q.No.2) Answer any five (out of seven) of the following   (14)
i)
ii)
iii)
iv)
v)
vi)
vii)
viii)
xi)

Q.No.3) A) Answer any two of the following   (10)
i)
ii)
iii)

B)   (4)

Q.No.4) Attempt any two of the following   (14)
i)
ii)
iii)
iv)

Q.No.5) Attempt any two of the following   (14)
i)
ii)
iii)

SOLAPUR UNIVERSITY, SOLAPUR

B.Sc.II-Zoology-
Choice Based Credit System (CBCS)
Syllabus

(w.e.f.-2017-18)

SEMESTER-III
THEORY

Paper	Title of the Paper	Marks
V	Animal Diversity -III	100 (70UA+30CA)
VI	Cell Science, Genetics, Biological Chemistry and Economic Zoology	100 (70UA+30CA)

SEMESTER-IV
THEORY

Paper	Title of the Paper	Marks
VII	Animal Diversity -IV	100 (70UA+30CA)
VIII	Histology and Physiology	100 (70UA+30CA)

PRACTICAL
TO BE TAKEN AT THE END OF SEMESTER-IV
Title of the practical

Practical I&II	Practical Based on Theory Papers V, VI, VII,VIII	Marks 200 (140UA+60CA)

UA- University Assessment
CA- College Assessment

SOLAPUR UNIVERSITY, SOLAPUR
B.Sc.II-Zoology –C B C S PATTERN
w.e.f. 2017-18
Semester-III
Paper-V- Animal Diversity III
Contact Hours:45
Total credits-3

Unit No.I	**Taxonomy:** Salient features and Classification up to classes of the following with suitable examples: Arthropoda, Mollusca, Echinodermata and Hemichordata	**05**
Unit No.II	**Type Study- 1. Cockroach (Phylum-Arthropoda)** i) Systematic Position ii) Habit and Habitats iii) External Morphology iv) Study of the following systems: a) Digestive system b) Respiratory system c) Circulatory system d) Nervous system and compound eye e) Excretory system f) Reproductive systems v) Economic importance	**15**
Unit No.III	**Type Study- 2. Pila (Phylum-Mollusca)** i) Systematic position ii) Habit and Habitats iii) External morphology: Shell and Pallial Complex iv) Study of following systems: 　a) Digestive system 　b) Respiratory system 　c) Blood Vascular System 　d) Nervous system and Sense organs-Eye, Osphradium, Statocyst 　e) Excretory system 　f) Reproductive systems v) Economic importance	**15**
Unit No.IV	**A)** Study of Insect mouth parts: Cockroach, Honeybee, House fly, Butterfly and Mosquito **B)** Mosquito as insect vector in human diseases with reference to : Malaria, Filaria, and Dengue disease (Prevention, Control measures and Treatment expected).	**05**
Unit No.V	a) Study of Foot in Mollusca b) Affinities in Hemichordata c) Amazing invertebrates – 　Offence and defence mechanism – Ink gland in Sepia 　Bioluminescence　　　　—　Firefly	**05**

List of Recommende Books:

1) Arthropoda, Mollusca and Echinodermata-Kotpal R.L.(Series)
2) Mollusca- Morten J.E.

3) Echinodermata- Nichols D.
4) Invertebrate- Kotpal R.C.
5) Invertebarate Zoology- Jorden E.L. and Verma P.S.
6) Biology of Invertebrates – Russel – Hunter
7) The Text Book of Invertebrate Zoology – Shrivastava

Paper-VI- Cell Science, Genetics, Biological Chemistry and Economic Zoology
Contact Hours:45
Total credits-3

Unit No.I	**Cell Science-** a) Study of cell cycle ; b) Study of Cell division: Mitosis and Meiosis c) Specialized cell : Leucocytes (WBC) (with reference to - types , structure and functions)	**05**

Unit No.II   **Genetics-**   **03**

i) **Linkage:** Definition ,Complete linkage and Incomplete linkage with examples of *Drosophila*

ii) Mechanism of Crossing over and its Significance

iii)Gene interaction -
   a) Supplementary genes
   b) Complementary genes

iv) Human genetics : Human chromosomal disorders
   a) Downs syndrome
   b) Turners syndrome
   c) Klinefelter syndrome

Unit No.III   **Biological Chemistry-** Biomolecules- (Definition, Structure, Types and Biological significance):   **05**

i) Carbohydrates
ii) Proteins
iii) Lipids
iv) Nucleic Acids (DNA and RNA)

Unit No.IV   **Economic Zoology-**   **05**

1) Economic Fishery
i) Fresh water Fish farming- Construction and Maintenance
ii) Economic importance of fishes
iii) Maintenance of glass aquarium and ornamental fishes

2) Sericulture   **05**
i) Types of Silk moth
ii) Morphology of mulberry silk moth
iii) Life cycle- Silk moth
iv) Rearing of silkworm
v) Economic importance

3) Apiculture   **05**
i) Types of honey bees and caste
ii) Honey comb
iii) Bee keeping- Modern methods , Instruments and appliances used in Apiculture
iv) Economic importance

Unit No.V   **4) Dairy Science**   **02**
i) Economics importance-Milk and Milk Products.

5) Poultry Science: **05**
i) Poultry breeds-Indigenous and exotic breeds
ii) Feeding
iii) Housing and   Management
v) Food value-   egg and meat
vi) Poultry diseases-Small pox and Ranikhet
6) Goat Farming
i) Breeds
ii) Feeding   **05**
iii) Housing
iv) Economic importance

List of Recommended Book :

1) The Cell-Bruce Albert
2) The Cell- De Roberties
3) Cell Biology-C.B. Power
4)The Cell-Cooper
5) Biochemistry – Lehninger A.L.
6) Biochemistry –Das
7) Biochemistry Vol I-Dasgupta S.K.
8) Biochemistry – Voet and Voet
9) Biochemistry – Stryer
10) Molecular biology – Gupta P.K.
11) Principles of Genetics – Gardner
12) Genetics – Strickberger
13) Cell biology, Genetics, Evolution – Verma Agrawal
14) Molecular Biology of the Gene – Watson J.D.
15) Fish Culture – K.H. Alikuhni
16) Fish Culture – Lagler
17) Hand Book of Animal Husbandary and Dairy –Mudlyer
18) Bee keeping in India – Sardar Sing
19) Bee Keeping in India – M.G. Smith
20) Poultry keeping in India – Naidu P.N.M.
21) Poultry Husbandry – M.A. Jule
22) Introduction to sericulture – Ganga and Shetty
23) The cell- Varute and Bhatia

Semester-IV
Paper-VII- Animal Diversity IV
Contact Hours:45
Total credits-3

Unit No.I	**Taxonomy:** Salient features and classification of Reptiles, Birds and Mammals up to orders with suitable examples	**05**

Unit No.II	**Type study: 1. Rat**
	i) Systematic position
	ii) Habit and Habitats
	iii) External Morphology
	iv) Study of following systems:
	  a) Digestive system
	  b) Respiratory system
	  c) Circulatory system
	  d) Excretory system
	  e) Nervous system- Brain and Spinal cord
	  f) Sense Organs – Eye and Ear
	  g) Reproductive systems (Male and Female)
		20

Unit No.III	**Study of general topics:** A. Mesozoic reptiles: Dinosaurs a) Aquatic : Ichthyosaurs and Plesiosaurs b) Terrestrial : Pterosaurs, Herbivorous (Brontosaurus) and Carnivorous (Tyranosaurus) B. Salient features and affinities: Monotremes and Marsupials C. Dentition in mammals: Introduction, Herbivorous, Carnivorous and Omnivorous with examples	**10**
Unit No.IV	**Poisonous and non-poisonous snakes:** a) Identification features with examples b) Poison apparatus c) Venom : its effects and medicinal uses d) Anti-venom production e) First aid treatment of Snake bite	**05**
Unit No.V	i) Archaeopteryx ii) Aerial adaptations in birds iii) Beak and Leg modification in birds iv) Migration in Birds	**05**

List of Recommended Books:
1) Rat : Rowett
2) Rat : Kshirsagar G.R.
3) T.B.of vertebrate Zoology-Prasad S.N.I
4) Vertebrates – Kotapal R.C.
5) Comparative vertebrate anatomy-Hyman L.H.

Paper-VIII- Histology and Physiology
Contact Hours:45
Total credits-3

| Unit No.I | **Study of Tissues** | 05 |

(Study of following tissues with reference to origin, location and functions)
i) Epithelial ii) Connective iii) Muscular iv) Nervous

| Unit No.II | **Histology of following mammalian organs:** | 15 |

i) Tooth ii) Tongue iii) Salivary gland iv) Stomach v) IIeum
vi) Liver vii) Pancreas viii) Kidney ix) Testis x) Ovary xi) Uterus

| Unit No.III | **Reproductive physiology:** | 10 |

i) Pituitary gland and its hormones
ii) Sex hormones
iii) Oestrous cycle
iv) Menstrual cycle
v)Hormonal control of pregnancy, parturition and lactation
vi) Hormonal control of testicular activity
vii) *In-vitro* fertilization
viii) Amniocentesis

| Unit No.IV | **Study of Contraceptives: Male and Female** | 05 |

    i) Natural methods : Abstinence, Rhythm
    ii) Mechanical methods: Condom, Diaphragms
    iii) Chemical methods: Tablets , Creams
    iv) Intra uterine device: Copper – T
    v) Oral contraceptives – Pills
    vi) Surgical methods : Tubectomy , Vasectomy

| Unit No.V | **Body defense mechanism-** | 10 |

A) Organs involved in immune system
a) Primary lymphoid organs : Bone marrow and Thymus
b) Secondary lymphoid organs: Lymph nodes , Spleen , Tonsil

B) Immune system
i) Humoral immunity and its mechanism
a) B-Cell Immunity
b) Typical structure of antibody and its types
ii) Cellular immunity and its mechanism
a) Types of T-Cell
b) T-Cell Immunity

List of Recommended Books:

1) Histology – Ham A.W.
2) Baileys's T.B. of Histology – Williams and Williams
3) An Atlas of Histology – Heineman Educational Book Ltd.London
4) Microscopic anatomy of vertebrates –Lea and Febigen, Philadelphia
5) Histology of Mammals – Atavale M.V. and Latey A.N.
6) Human physiology by Chatterjee C.C.
7) Physiology – A.C. Guyton

Practical Course in Zoology for B.Sc. II
Semester III and IV (Total Credits 2+2=4)
(Final practical examination to be conducted at the end of Semester IV)

Practical – I   **Total credits-2**

I.   **Taxonomy-**
     Classification with morphological peculiarities of the following up to classes.
     a) Arthropoda- Apus, Balanus, Prawn, Lobster, King-crab, Grasshopper, Butterfly,
     Moth, Milleped, Centipede, Scorpion, Spider, Peripatus
     b) Mollusca – Chiton, Dentalium, Patella, Aplysia, Snail, Slug, Mytilus, Pearl Oyster,
     Sepia, Octopus
     c) Echinodermata – Sea-star, Brittle star, Sea-lilly, Sea urchin, Sea cucumber
     d) Hemichordata – Balanoglossus

II. Study of Cockroach-
     a) External characters and sexual dimorphism (CD/Model/Chart/ virtual)
     b) Anatomical observation and detailed explanation of systems using
     CD/Model/Chart of
     i) Digestive system
     ii) Nervous system
     iii) Male reproductive system
     iv) Female Reproductive system
     c) Anatomical observation and detail explanation of systems using CD/Model/Chart /
     virtual of
     i) Walking leg
     ii) Mouth parts
     iii) Thoracic spiracles
     iv) Salivary apparatus
     v) Gizzard
     vi) Cornea
     vii) Trachea

III. Study of Pila-
     A) External character- Shell, Pallial complex (CD/Model/Chart / virtual)
     B) Anatomical observation and detailed explanation of systems using
     CD/Model/Chart of
     i) Digestive system
     ii) Nervous system
     C) Observation and detail explanation using CD/Slide/Model/Chart/ virtual of
     i) Osphradium
     ii) Radula
     iii) Statocyst

IV. **Study of mouth parts** of : Honey bee, Mosquito, Butterfly, Housefly using
     permanent slides/CD/Model/Chart

V.   **Mosquito as disease vector** : Whole mounts of Anopheles, Culex, Aedis using
     permanent slides/CD/Model/Chart

VI. **Study of foot in mollusca** with reference to Chiton, Pila, Mytilus, Unio,
     Sepia/Octopus using museum specimens/CD/Model/Chart

VII.   Study of mitosis using onion root tip

VIII.   Study of WBCs (leucocytes) by blood smear staining technique and their identification .

IX.   Examples in genetics (at least 10 examples): Examples based on Crossing over, Linkage and interaction of genes

X.   Detection of Carbohydrates(Gulcose, Fructose, Maltose/Lactose, Starch), Proteins and Lipids.

XI.   Colorimetric estimation of protein by biuret method

XII.   Colorimetric estimation of glucose by suitable method

XIII.   Study of Glass aquarium fishes using laboratory specimens/photographs/CD/videos (Any five fishes)

XIV.   **Study of Apiculture** – Honey bee chamber , honey extractor ,decapping knife, mask , gloves , Honey, Bee wax , laboratory material/ model/ chart

XV.   **Study of Sericulture** – Study of Silk moth, Silk cocoons, and Silk using laboratory specimens/material

XVI   **Study of Dairy Science** – Study of Milk and Milk products using available material

XVII.   **Study of Poultry Science**- Different kinds of Poultry birds, Eggs and Poultry manure using available laboratory specimens/material

Practical –II   **Total credits-2**

I.   **Taxonomy-**(Models/Photographs/Sketches)
Classification with morphological peculiarities of the following up to orders:
i) Reptiles – Turtle, Tortoise, Chamaeleon, Garden lizard, Crocodile
ii) Aves – Duck, Kite, Woodpecker, Sparrow, Sunbird, Vulture, Kingfisher, Fowl.
iii) Mammals - Platypus, Bat, Scaly anteater, Loris, Rabbit

II.   **Study of Rat** : Anatomical observation and detailed explanation of the following system with CD/Model/Chart/Virtual of
i) Digestive system
ii) Respiratory system
iii) Arterial system
iv) Venous system
v) Excretory system
vi) Reproductive systems (Male and Female)

III.   Anatomical observation and detailed explanation of brain of Rat with CD/Model/Chart/Virtual -

IV.   Observation and detail explanation of following tissue with reference to structure , location and functions (with CD/Slide/Model/Chart)-

       i) Epithelial ii) Connective iii) Muscular iv) Nervous

V.   Study of Mesozoic reptiles (using chart/models/CD)

VI.   Identification of the following poisonous and non poisonous snakes using laboratory specimens chart/model/lab specimens
i) Cobra ii) Russel's Viper iii) Indian little Viper (Phoorsa) iv) Krait v) Sea snake
vi) Rat snake vii) Sand boa

VII.   Study of Beak and Leg modification in birds using laboratory specimens
i) Parrot ii) Woodpecker iii) Heron iv) Duck v) Sparrow/Pigeon vi) Hawk/Kite
viii) Owl ix) Vulture

VIII. Study of dentition in mammals using laboratory materials/models/CD of:
Sheep, Rat, Rabbit, Dog, Man

IX.   Study of histological structure (T.S./V.S.) of the following mammalian organs using permanent slides:
i) Tooth ii) Tongue iii) Salivary gland iv) Stomach v) IIeum
vi) Liver vii) Pancreas viii) Kidney ix) Testis x) Ovary xi) Uterus

X.   Study of Oestrus cycle using CD/Chart/Permanent slides

XI.   Study of following abnormal urine constituents: Glucose, Bile, Blood and Albumin

XII.   Study of ABO blood group system and blood group antigens

XIII. Study of following contraceptives: Oral contraceptives (pills), Intra-uterine device, Condom using chart/photographs.

XIV   Methods and techniques of bird watching and in campus field visit to record avifaunal diversity .

Excursion Tour : Six days tour is recommended

As a part of practical, visit to sea-shore/any suitable place of Zoological interest (Visit to sea-shore, Fishery Centers, National Parks, Wildlife Sanctuaries, National Research Institutes, Central Research Institutes, Zoological Survey of India, Fresh Water Ecosystem etc. to study animal diversity and economic Zoology. A report is to be submitted at the time of Practical examination.

OR

Review of article (research / magazine /news paper) based on syllabus of semester III and IV and submission of report / project

Note:

As per the guidelines of **UGC notification number F.14-6/2014(CPP-II) dated 1ˢᵗ August, 2014** it is now essential to make necessary modifications to stop dissection and promote and orient students towards the knowledge component rather than skill development. However, ITC based virtual dissections are promoted. Now, the responsibility to discontinue dissections and use of animals in experiments totally rests on concerned authorities of respective colleges/Institutes. As per the notification it is important to encourage the field trips and observations without disturbing the biodiversity.

Equivalence of the new CBCS Course

S No	Title of old CGPA Paper	Title of New CBCS Paper
1	Paper III : Animal Diversity -III	Paper V: Animal Diversity -III
2	Paper IV :Cell Science, Genetics, Biological Chemistry and Economics Zoology	Paper VI :Cell Science, Genetics, Biological Chemistry and Economics Zoology
3	Paper V :Animal Diversity -IV	Paper VII : Animal Diversity -IV
4	Paper VI : Histology and Physiology	Paper VIII :Histology and Physiology

Distribution of Marks for Practical Examination in B.SC.II-Zoology
[Total Marks-200 (UA-140+CA-60)]

PRACTICAL I :

Q.1	Analysis and explanation of anatomical part of given figure/CD/Chart/Model of Cockroach & *Pila*	Marks 12
Q.2	Analysis and explanation of anatomical part of given figure/CD/Chart/Model of Cockroach & *Pila*	Marks 08
Q.3	Cytological preparation of mitosis/W.B.C. Study by Staining technique	Marks 10
Q.4	Genetics example	Marks 10
Q.5	Biochemical tests/Estimations of protein/glucose	Marks 10
Q.6	Identification/Spotting	Marks 10
Q.7	Journal (Practical Record Book)	Marks 10
		Total Marks 70

PRACTICAL II:

Q.1	Analysis and explanation of anatomical part of given figure/CD/Chart/Model of brain of Rat	Marks 12
Q.2	Analysis and explanation of given figure/CD/Chart/Model of –various tissues(epithelial/connective/muscular/nervous)	Marks 08
Q.3	Detection of abnormal constituents of urine	Marks 10
Q.4	Study of oestrus cycle by using chart /Blood group antigens detection	Marks 10
Q.5	Submission of excursion report/ article review report or project and viva based on it	Marks 10
Q.6	Identification/Spotting	Marks 10
Q.7	Journal (Practical Record Book)	Marks 10
		Total Marks 70