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	DSC 1C	Paper-V	3.0	--	--	50	40	10	4.0
		Paper-VI		3.0	--	--	50	40	10	
subjects among the Four	DSC 2C	Paper-V		3.0	--	--	50	40	10	4.0
Subjects offered at B.Sc.I. Out		Paper-VI		3.0	--	--	50	40	10	
of Three Subjects offered One	DSC 3C	Paper-V		3.0	--	--	50	40	10	4.0
Subject will be the Core Subject OR		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										
	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

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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)

3.1Structure and development of embryo in Monocotyledons.
3.2Structure 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.
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7. Salisbury Ross – Plant Physiology. CBS, Publishers & Distributions 485/ Jain Bhawan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
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9. G. Ray Noggle / G. Fritz- Introductory Plant Physiology. Prentice Hall of India Ltd. New Delhi – 110001.
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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.
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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.
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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.
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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
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23. Maheshwari P. An introduction to Embryology of Angiosperms.
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25. S. C. Datta. Systematic Botany. New Age International Publishers, New Delhi. (2015).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. II Practical Examination in Botany (CBCS)

March/April 2020

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc. II Practical Examination IN Botany (CBCS)
Practical -III
March/April 2020

Center:

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N.B.-

1. Draw neat & labelled diagrams wherever necessary

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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

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

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(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

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B.Sc.II SYLLABUS WITH EFFECT FROM JUNE 2020

SEMESTER- III

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Unit 1: Meristematic tissue   (8 Lectures)

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Classification of meristem based on origin, position and plain of division.
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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

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Anamalous l secondary growth in Bignonia (Dicot.) and Dracaena stem.
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mechanism of enzyme action.
Properties of enzymes.

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

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Introduction
Discovery
Types of growth regulators
a. PGR - auxins, gibberellins, cytokinins (Physiological role of growth regulators)
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Macronutrients, Role of macronutrients (N, P, K), Role of Micronutrients (Fe, Mn.)

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Introduction and
Broad classification;
Monosaccharides - Properties and examples (Triose , Tetrose, Pentose and Hexose)
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  Vernalization: Definition, Mechanism, Significance.

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Definition of Symplastic transport and apoplastic transport,
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Source and sink relationship : During vegetative and reproductive phase.

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Photosynthetic Pigments (Chl a, b, xanthophylls, carotene);
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Dark reaction – C3, C4, CAM Pathway

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

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Introduction:
  Site of photorespiration
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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.

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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.

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3.1Structure and development of embryo in Monocotyledons.
3.2Structure and development of embryo in Dicotyledons.
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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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc. II Practical Examination IN Botany (CBCS)
Practical -III
March/April 2020

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

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: Chemistry

Name of the Course: B.Sc. II (Sem–III & IV)
(Syllabus to be implemented from w.e.f. June 2020-21)

Course outcomes:

    Student should learn

1. Basics of the chemistry along with the practical applications/skills, industrial usage
2. The principles underlying the different experiments
3. Functional group conversions
4. Preparation of standard solutions and analytical skills
5. Handling of instruments to develop instrumental skills with respect to industries
6. Nomenclature of inorganic and organic compounds and their characterization

P. A. H. Solapur University, Solapur
B.Sc. Part-II Chemistry
Choice Based Credit System (CBCS)
In force from June-2020

General Structure :

There will be two theory papers of 50 marks (UA 40 + CA 10 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 should be in proportion with 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 50 marks	(40 + 10 marks)
Paper-VI	: Inorganic Chemistry 50 marks	(40 + 10 marks)

Semester-IV

Paper-VII	: Physical Chemistry 50 marks	(40 + 10 marks)
Paper-VIII	: Analytical & Industrial Inorganic Chemistry 50 marks (40 + 10 marks)

Practical Course : Practical Examination will be held at the end of the year - 100 marks = (UA 80 + CA 20)

A) Distribution of marks :

a) Physical   : 20 marks (15 marks physical experiment + 5 marks oral + Journal- 3 marks

b) Inorganic   : 30 marks
   (gravimetric analysis-15 marks +
   Preparation- 10 marks /Volumetric
   estimation – 15 marks + Preparation- 10
   marks/ semi-micro analysis 15 marks +
   Preparation- 10 marks   +_5 marks oral + Journal- 4 marks

c) Organic   : 20 marks (organic qualitative Analysis- 15 marks/ estimation- 15 marks/ preparation- 15 marks
   oral- 5 marks + Journal- 3 marks

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: 2
(45 Contact hrs.)

UNIT-I

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 max 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

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 $\overset{--}{CN}$, $\overset{--}{OH}$, $\overset{--}{I}$, 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

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

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 1_{st} transition series with 2_{nd} & 3_{rd} 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
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
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

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

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   :   80 marks

Internal practical Examination   :   20 marks

Total   100 Marks = Credits : 2

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

* University Examination : (Two Day Exam)	Expt	Journal	Oral	Total
Q.1: Physical Chemistry Experiment	15	3	5	23
Q.2 : Inorganic Chemistry Experiment	25	4	5	34
Q.3 : Organic Chemistry Experiment	15	3	5	23

* Internal Examination :
    Practical paper has 20 marks for Internal Examination.
    There will be **two** practicals of 10 marks each.

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)

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.   Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.

    ii.   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. Preparation of tetramminecopper(II) sulpate

iii. Preparation of Chlorpentamminecobalt(III) chloride

iv. Preparation of hexamminenickel (II) chloride.

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-}

Note : At least SIX mixtures to be completed.

Reference Books :

1. Quantitative 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 Quantitative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.

N. B. – 1. Calculations of % yield is expected.

     2 After preparation, physico-chemical characterization is expected with 5(Five)

     marks weightage in terms of:

a) Name of central metal ion

b) Oxidation number of metal ion

c) Nature of ligand

d) Nature of bonding

e) Type of hybridization

f) Inner orbital or outer orbital complex

g) Geometry of the complex with structure

h) Magnetic property of the compound

i) Color of the compound

j) Nature :Crystalline /Amorphous

(Note: Preparation should be take in semester-III)

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.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Electronics

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
Syllabus
For B.Sc. II Electronics
(CBCS Pattern)
Choice Based Credit System (CBCS) Pattern
To be implemented from Academic Year 2020-21

1. **Preamble:**

    B.Sc. II syllabus is designed to provide an insight into applications of various circuit blocks, design analog and digital systems, methods to analyze working of systems and some of consumer products. Training on system design and simulations. In the theory courses adequate knowledge of analog systems design, digital system design and communication systems will be acquired by the students. Student taking admission at S.Y. B. Sc. Electronics has to complete 4 theory courses 2 each semester, two practical courses (Annual). In the practical course of 100 marks there are compulsory experiments for practical course Sem III and IV. The details are mentioned in the syllabus.

2. **Objectives of the course:**

    The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, devices, circuits and products and development of appropriate practical skills suitable for industrial needs. Objectives are
    - To design the syllabus with specific focus on key Learning Areas.
    - To equip student with necessary fundamental concepts and knowledge base.
    - To develop specific practical skills.
    - To impart training on circuit design, analysis, building and testing.
    - To prepare students for demonstrating the acquired knowledge.
    - To encourage student to develop skills for accepting challenges of upcoming technological advancements.

3. **Course Structure:**

Paper No.	Subject	Title of the course	Marking Scheme			L	T	P	Credits
			UA	CA	Total				
Semester –III Electronics									
V	Electronics	Electronic Circuits	40	10	50	3	-	-	2
VI	Electronics	Pulse and Switching Circuits	40	10	50	3	-	-	2
		Total	**80**	**20**	**100**	**6**	**-**	**-**	**4**
Semester –IV Electronics									
VII	Electronics	Operational Amplifier and Applications	40	10	50	3	-	-	2
VIII	Electronics	Digital Techniques and Microprocessor	40	10	50	3	-	-	2
		Total	**80**	**20**	**100**	**6**	**-**	**-**	**4**
Practicals		Practical III & IV	80	20	100	-	-	8	4
		Total	**80**	**20**	**100**	**-**	**-**	**8**	**4**
		Grand Total	**240**	**60**	**300**	**12**	**-**	**8**	**12**

4. **Distribution of each Theory paper (Marks 50)**
    a. University Assessment (UA)   **:**   40 Marks
    b. College Assessment (CA)   **:**   10 Marks

    Scheme of College Assessment
    1. Unit Test   **:**   5 Marks
    2. Home Assignment   **:**   5 Marks

5. **Distribution of Practical Marks (100)**
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 (80) Marks   : (UA)
    a) Practical from group A   **:**   18
    b) Practical from group B   **:**   18
    c) Practical from group C   **:**   18
    d) Practical from group D   **:**   18
    e) Journal   **:**   08

B. Break up of 18 marks for each practical (UA)
    a) Circuit diagram / Flow Charts   **:**   03
    b) Assembly of the circuit /Programming   **:**   03
    c) Procedure / Observations   **:**   03
    d) Graph /Calculations/ Execution   **:**   03
    e) Results/Comments   **:**   03
    f) Oral   **:**   03

C. Practical: Internal Continuous Assessment (20 marks)

Scheme of Marking

- Internal Test on practical's / Skill enhancement mini project   **: 1**0 Marks
- Home assignment/Seminars/conference/workshop/industrial visit   : 10 Marks

B.Sc. II-Electronics (CBCS Pattern)
Semester – III
Paper –V-Electronic Circuits

Total Marks: 50
(45 periods)

1. **Rectifiers, Filters and Regulators** **(07)**
   Diode rectifiers: Half wave, full wave and bridge rectifier, derivation of Ripple factor, Efficiency and PIV of half wave and full wave rectifier (center tapped), Capacitor filter, Zener regulator

2. **Transistor Biasing** **(07)**
   Transistor biasing, DC load line, Operating point, Stability factor,
   Methods of transistor biasing: Fixed Bias, Emitter Bias, Voltage divider bias with mathematical treatment

3. **Transistor Amplifiers** **(17)**
   Basic action of transistor amplifier, DC (Thevenin's) and AC analysis of CB, CE, CC configurations, comparison of CB, CE, CC configuration, FET as CS amplifier (Analysis and its applications)
   Multistage Transistor Amplifier: RC Coupled, Transformer Coupled, Direct Coupled amplifier, Darlington pair amplifier
   Power Amplifiers: Types of power amplifiers - Class A, Class B and Class C amplifiers by Graphical Method, Class A and Class B push pull amplifier, cross over distortion, Class AB amplifier, complementary-symmetry amplifier, harmonic distortion in power amplifiers,

4. **Feedback Amplifiers** **(08)**
   Theory of feedback amplifier, positive and negative feedback, Effect of negative feedback on Gain, Bandwidth, Distortion, Noise, Input impedance and Output impedance, Types of negative feedback, Analysis of current series feedback circuit (Numerical Examples)

5. **Transistor Oscillators** **(06)**
   Barkhausen criterion, **RC oscillators:** Wien bridge oscillator, Phase shift oscillator, **LC oscillators:** Hartley oscillator, Colpitt's oscillator (Without mathematical treatment), Piezoelectric crystal and its equivalent circuit, Pierce Crystal oscillator (Circuit description, condition for oscillation and Numerical Examples)

Reference Books:
1. A text book of Applied Electronics by R. S. Sedha. S. Chand Publication.
2. Electronic Devices and Circuits by Boylstead
3. Basic Electronics (Solid State) by B. L. Theraja, S. Chand & Company Ltd.
4. Basic Electronics and Linear Circuits by N. N. Bhargaya D. C. Kulshreshtha & S. C. Gupta TMH

B.Sc. II-Electronics (CBCS Pattern)
Semester – III
Paper –VI- Pulse and Switching Circuits

Total Marks: 50
(45 periods)

1. **Wave shaping Circuits** (08)

   Need of wave shaping circuit, linear wave shaping circuits: Differentiator and Integrator Non linear wave shaping: Diode Clipping and Clamping circuits.

2. **Time base Circuits** (09)

   General features of Time base signals, Concept of RC time base circuit, UJT as a relaxation oscillator, Linearity considerations with constant current source, Miller integrator and bootstrap circuit.

3. **Multi-vibrators using BJT** (13)

   Transistor as a switch, switching characteristics, Types of multivibrator
   Astable multivibrator (collector coupled): Operation, Wave forms, Derivation of output frequency.
   Monostable multivibrator (collector coupled): Operation, Triggering methods, Waveforms, Derivation of gate width.
   Bistable Multivibrator (collector coupled): Operation, Triggering methods, Wave forms,
   Schmitt's Trigger: Operation, Hysterises curve (UTP, LTP),
   (Uses and Numerical Examples)

4. **Multi-vibrators using Gates** (05)

   Astable multivibrator using gates, Monostable Multivibrator using gates and IC74121.

5. **IC 555 Timer** (10)

   IC-555 timer- Pin configuration, functional block diagram, Astable multivibrator: Operation, wave forms, Derivation of frequency and duty cycle, Monostable multivibrator: Operation, wave forms, Derivation of gate width, Applications of IC 555 as Sequential Timer, Battery charger, Voltage controlled Oscillator.
   (Numerical examples)

Reference Books

1. Pulse and Switching circuits by Millman and Taub
2. Hand book of Electronics by Sony Gupta.
3. A Text of Applied Electronics by R.S.Sedha, S. Chand Publication
4. Electronic Devices and Circuit by Boylestead
5. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)

B.Sc. II-Electronics (CBCS Pattern)
Semester – III
Paper –VII : Operational Amplifier and Applications

Total Marks: 50
(45 periods)

1. **Differential Amplifier** (09)

   Need of differential amplifier, Types of differential amplifiers, Emitter coupled differential amplifier, Operation, Common mode gain and Differential mode gain, Derivation of A_d, A_c and CMRR, Constant current bias, Current mirror bias.

2. **Operational Amplifier** (09)

   Introduction, Block diagram, Equivalent circuit of op-amp, Ideal characteristics, open loop and closed loop configuration and its need,

   Op-amp parameters: Output offset voltage, Input offset voltage, Input bias current, Input offset current, Input impedance, Output impedance, CMRR, Slew rate, Maximum power bandwidth, PSRR, Specifications of IC 741

3. **Operational Amplifier Linear Systems** (11)

   Concept of virtual ground, Inverting amplifier, Non-inverting amplifier, Voltage follower, summing amplifier (Adder), Op-amp differential amplifier (subtractor), Differentiator, Integrator, Current to Voltage converter and Voltage to Current converter

4. **Operational Amplifier Non-linear Systems** (07)

   Basic comparator, Zero-crossing detector, Regenerative comparator (Schmitt Trigger), Precision rectifier (Half wave)

5. **Wave form Generators** (09)

   Oscillators - Phase shift oscillator, Wien Bridge oscillator, (without mathematical treatment)

   Astable multivibrator, Monostable multivibrator (with mathematical treatment)

   Triangular wave generator, Saw tooth oscillator,

Reference Books:

1. Linear Integrated Circuit – D. Roy Choudhari, Shail Jain (Wiley Eastern Ltd.)
2. Integrated Circuit (New Edition) – K. R. Botkar
3. Integrated Electronics – Millman , Halkies (MGH)
4. Op-Amps and Linear circuits – Ramakant A. Gaikwad (PHI)
5. Operational Amplifiers and Linear ICs – Caughlin and Driscoll (PHI)
6. Design with Operational Amplifiers and Analog ICs – Franco (McGraw Hill, 2000)

B.Sc.-II-Electronics (CBCS Pattern)
Semester-IV
Paper-VIII : Digital Techniques and Microprocessor

Total Marks: 50
(45 periods)

1. Semiconductor Memories: **(7)**

Memory cell (Static and Dynamic), Memory organization, memory parameters (type, size), Classification of memory (volatile and non volatile) and their comparison, Concept of flash memory

Study of memory chips: 2764, 6264 (Features & Pin description)

2. Data Converters: **(9)**

Basic concepts of Digital to analog conversion (DAC) and Analog to digital conversion (ADC), specifications

Digital to analog conversion: Binary weighted and R - 2 R ladder networks

Analog to digital conversion: Comparative (Flash), Successive approximation, dual slope ADC techniques, Study of DAC (IC 0808) & ADC (IC 0804) (Features & functional description)

3. Fundamentals of Microprocessor: **(10)**

Introduction to microprocessor, Basic system with Bus Architecture

The microprocessor Intel 8085: Salient Features, Block diagram, pin descriptions, Address/data bus, Data bus, control signals, ALU, Accumulator, Flags, Registers, Interrupts, Clock & reset circuit, concepts of T-state, Machine cycle, Instruction cycle.

4. Programming with Microprocessor: **(10)**

The Instruction, Instruction set of 8085, Instruction format, Addressing modes, Classification of instruction set, as per function, Algorithm, Flowchart, Assembly language programming of Data transfer (Block transfer & exchange), Arithmetic operation (addition, subtraction, multiplication, division), logical operation (AND, OR, NOT, XOR), ALP on Branch operation.

5. Interfacing techniques: **(9)**

Concept of Tristate logic, Study of IC 74244, 74245, 74373 (Features and Pin diagram)

De-multiplexing of Address/data bus using IC74373

Generation of control signal $\overline{MEMR}, \overline{MEMW}, \overline{IOR}, \overline{IOW}$ (using gates and IC 74138)

Need of Interfacing, Interfacing techniques, I/O mapped I/O, Memory mapped I/O and their comparison

Address decoding (absolute and linear), Interfacing of memory chips 2764 and 6264 to the 8085 microprocessor

Recommended Books:
1. Digital Principles and Applications by A. P. Malvino & D.P. Leach (TMH), Delhi
2. Digital Fundamental by Floyd, Pearson Education.
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S. Gaonkar
4. Microprocessor by A. P. Godse

B.Sc.–II-Electronics (CBCS Pattern)
Practical Course
List of Experiments

Group A

1) Designing of biasing network by using simulation software.
2) Study of single stage CE / CB amplifier. (Gain, I/P & O/P impedance)
3) FET CS amplifier (Gain, I/P & O/P impedance)
4) Emitter follower (Gain, I/P & O/P impedance)
5) Negative feedback amplifier. (Frequency response & feedback factor)
6) RC Phase shift oscillator (Design & testing)
7) Wein bridge oscillator by using simulation software
8) Hartley oscillator (Design & testing)
9) Colpitt's (Design &testing)
10) Crystal oscillator (Pierce oscillator)

Group B

1) Miller integrator
2) UJT oscillator with constant current source
3) Astable multivibrator using BJT
4) Monostable multivibrator using BJT
5) Bistable multivibrator using BJT (AC & DC) triggering by using simulation software)
6) Schmitt's trigger (hysterysis curve & square wave testing)
7) Astable multivibrator using IC 555.
8) Monostable multivibrator using IC 555
9) Astable multivibrator using IC7400 by using simulation software
10) Monostable multivibrator using IC74121

Group C

1) Op-amp parameters (O/P offset voltage, I/P offset voltage and slew rate)
2) Inverting and non inverting amplifier using op-amp
3) Op-Amp as a Adder / subtractor
4) Op-amp as voltmeter / ammeter
5) Op-amp as Schmitt's trigger
6) Wein-bridge oscillator using op-amp
7) Phase Shift Oscillator using op-amp by using simulation software
8) Astable multivibrator using op-amp by using simulation software
9) Monostable multivibrator using op-amp
10) Integrator / Differentiator using op-amp

Group D

1) DAC using R-2R Ladder network (4 bits)
2) Study of DAC (IC 0808)
3) Study of ADC (IC 0804)
4) Data transfer using 8085
5) Arithmetic operations using 8085 (8-bit Addition)
6) Arithmetic operations using 8085 (8-bit Subtraction)
7) Arithmetic operations using 8085 (8-bit Multiplication) by using simulation software
8) Arithmetic operations using 8085 (8-bit Division) by using simulation software
9) Logical operations (AND and OR) using 8085
10) Logical operations (NOT and XOR) using 8085

N.B:
1) Minimum 30 experiments must be performed out of which at least seven from each group.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: GEOLOGY

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

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

1) Preamble:

Syllabus for B.Sc. II Geology meets the needs of the students for building up is basics of petrology, its principles, properties of rocks, their environment and conditions of formation and importance in building the earth's crust. In the theory course student can also acquire the knowledge stratigraphy, geological time scale and methods of dispositions of various rock types. Emphasis has been given on the geology of India which includes stratigraphical characters and geographical distribution of various systems and groups in the country. The branch palaeontology is introduced to understand the origin and evolution of ancient life forms on the earth.

Theoretical knowledge coupled with extensive laboratory experiments and field training will help the students, to avail all opportunities available and even in start-up.

2) Objectives of the Course

1. To introduce students to types of rocks with their physicochemical properties, classification and genesis.
2. To impart field-oriented knowledge by understanding basic concepts of stratigraphy and Indian Geology.
3. To orient students to understand the evolution and distribution of early life on the earth.
4. To provide students with opportunities to apply practical knowledge to build their career in various fields.

3) Outcome of the Course

1. Students understand various concepts related to formation and characteristics of various types of rocks and apply knowledge in various rock industries, mining and construction industries.
2. Students tends to explore various unmapped regions.
3. Students gain a sense of preservation and conservation of natural resources.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Choice Based Credit System (CBCS)
(w.e.f.2020-21)
Draft Structure for B. Sc.- II

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks/ 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 Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR**	C-5	Paper-V	3.0	--	--	50	40	10	4.0
		Paper-VI	3.0	--	--	50	40	10	
	C-6	Paper-V	3.0	--	--	50	40	10	4.0
		Paper-VI	3.0	--	--	50	40	10	
	C-7 **GEOLOGY**	Paper-V **Igneous Petrology**	3.0	--	--	50	40	10	4.0
		Paper-VI **Sedimentary and Metamorphic Petrology**	3.0	--	--	50	40	10	
	SEC-1									
	GE-3									
Grand Total				**18**	**--**	**--**	**300**	**240**	**60**	**12**
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 will be Elective Subject	C-8	Paper-VII	3.0	--	--	50	40	10	4.0
		Paper-VIII	3.0	--	--	50	40	10	
	C-9	Paper-VII	3.0	--	--	50	40	10	4.0
		Paper-VIII	3.0	--	--	50	40	10	
	C-10 **GEOLOGY**	Paper-VII **Stratigraphy**	3.0	--	--	50	40	10	4.0
		Paper-VIII **Palaeontology**	3.0			50	40	10	
	SEC-2									
	GE-4									
	Environmental Studies		3.0	--	--	50	40	10	NC
Total (Theory)				**21**	**--**	**--**	**350**	**280**	**70**	**12**
Practical	C-5 & C-8	Pr. III&IV	–	–	8	100	80	20	4.0
	C-6 & C-9	Pr. III&IV	–	–	8	100	80	20	4.0
	C-7 & C-10	Pr. III&IV **GEOLOGY**	--	--	8	100	80	20	4.0
	GE-3 & GE-4									
Total (Practical)						**24**	**300**	**240**	**60**	**12**
Grand Total				**39**		**24**	**950**	**760**	**190**	**36**

*Core Subjects:

Chemistry / Physics / Electronics / Computer Science / Mathematics / Statistics / Botany / Zoology / Microbiology / Geology / Geography / Psychology
Core Subjects- (Additional)-Geochemistry / Biochemistry / Meterology / Plant Protection

Summary of the Structure of B.Sc. Programme

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practicals	Total -credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	--	--	12
Total		650	24	300	12	36

B.Sc. Programme:

Total Marks: Theory + Practical's   = 650 +300   = 950

Credits: Theory + Practical's   = 12 + 24   = 36

Number of Papers   Theory: Ability Enhancement Course (AECC)   : 00

                           Theory: Discipline Specific Elective Paper (DSE)   : 00

                           Theory: CC   : 06

                           Skill Enhancement Courses   : 00

                           GE   : 00

Total: Theory Papers   : 06

          Practical Papers   : 02

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
CBCS Pattern Syllabus of B. Sc. (Part-II), (w. e. f. June 2020)
Geology
DSC/CC – Theory course
SEMESTER – III

Title of the Paper – **V. IGNEOUS PETROLOGY**

Contact hours – 30   Total Marks 50 (UA – 40 + CA – 10) (Credit 2)

	C. hrs.
Unit-I:	
Igneous rocks: definition; Magma: definition, composition, types and origin; Forms of igneous rocks: concordant and discordant forms; Points required to describe textures of igneous rocks: 1) crystallinity, 2) granularity, 3) shape of crystal and 4) mutual relations of crystals or of crystal and glassy matter; Textures of igneous rocks: 1) Granitic, 2) porphyritic, 3) Ophitic, 4) Poikilitic, 5) Intergranular and 6) glassy. Structures of igneous rocks: 1) Vesicular and amygdaloidal, 2) ropy, 3) flow, 4) pillow, 5) columnar	08
Differentiation: liquid immiscibility, gravitational and filtration. Role of volatiles in differentiation	03
Assimilation: reaction between basaltic magma and acid igneous rocks, basaltic magma and sedimentary rocks, granitic magma and basic igneous rocks, granitic magma and sedimentary rocks. Bowen's reaction series.	04
Unit-II:	
Classification of igneous rocks based on: 1) mode of occurrence, 2) colour index, 3) silica percentage and 4) silica saturation	02
Crystallization of unicomponent (augite),	02
bicomponent [two independent – (diopside – anorthite) and mix-crystals – albite – anorthite system)] and	06
ternary magma (diopside – albite – anorthite system).	03
Detailed petrographic description of granite, pegmatite, granodiorite, rhyolite, syenite, diorite, gabbro, basalt and dolerite	02

Title of the Paper – **VI. SEDIMENTARY AND METAMORPHIC PETROLOGY**
Contact hours – 30   Total Marks 50 (UA – 40 + CA – 10) (Credit 2)

	C. hrs.
Unit-I:	
Sedimentary petrology: definition, processes of formation of sedimentary rocks – lithification and diagenesis.	**02**
Classification of sedimentary rocks:	
1) based on products of weathering – Residual, sedimentary, chemical and organic deposits ,	**02**
2) based on mineralogy – a) siliciclastic, b) carbonates (Limestone and dolomite), c) non carbonates - ironstones and banded iron formations (limonite, goethite and hematite and), d) phosphorites, evaporites (rock salt, gypsum) and e) organic-rich (carbonaceous) deposits (coal) and	**04**
3) based on size and shape of the grains.	**01**
Textures of sedimentary rocks – clastic, oolitic and pisolitic	**01**
Structures of sedimentary rocks – stratification, lamination, graded bedding, current bedding and ripple marks.	**02**
Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale and limestones. Residual rocks – laterite and bauxite	**03**
Unit-II:	
Metamorphic petrology: definition and agents of metamorphism.	**01**
Zones and grades of metamorphism,	**01**
Type of metamorphism – contact, regional, cataclastic, hydrothermal – with examples	**02**
Classification of metamorphic rocks based on fabric – foliated and non-foliated, stress and anti-stress minerals.	**02**
Structures of metamorphic rocks – granulose, slaty, schistose, gneissose and augen.	**03**
Introduction to metamorphic facies: zeolite, hornfels, blue schist, green schist, amphibolite, granulite and eclogite	**03**
Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble and phyllite	**03**

Books Recommended:
1.   Igneous & Metamorphic petrology. Turner, F.J. & Verhoogen, J., McGraw Hill Co.
2.   Igneous petrology. Bose, M.K., World press
3.   Principles of Petrology. Tyrell, G. W., Methuren and Co (Students ed.).
4.   Petrology, Igneous, Sedimentary and Metamorphic rocks. Ehlers, WG, and Blatt, H., CBS Publishers
5.   The study of rocks in thin sections. Moorhouse, WW., Harper and sons.
6.   Principles of Sedimentology. Friedman & Sanders, John Wiley and sons.
7.   Sedimentary rocks. Pettijohn, F.J., Harper & Bros. 3rd Ed.
8.   A text book of sedimentology. Prasad, C.,
9.   Introduction to sedimentology. Sengupta. S., Oxford-IBH.
10.   Metamorphic petrology. Turner, F.J., McGraw Hill.
11.   Petrology of Metamorphic Rocks. Mason, R., CBS Publ.
12.   Petrogenesis of Metamorphic Rocks. Winkler, H.G.C., Narosa Publications

Title of the Paper – **VII. STRATIGRAPHY**

Contact hours – 30   Total Marks 50 (UA – 40 + CA – 10) (Credit 2)

Unit-I: Lectures: 18-19	**C. hrs.**
Stratigraphy: definition, principles of stratigraphy; methods of stratigraphic correlation; Geological Time Scale.	**04**
Stratigraphic classification – litho-stratigraphy, chrono-stratigraphy and bio-stratigraphy and their units. Physiographic divisions of India.	**03**
Study of following Precambrian succession: Dharwar, Cuddapah, Vindhyan and Delhi Supergroups with their classification, stratigraphic succession, distribution and economic importance	**08**
Unit-II: Lectures: 18-19	
Brief idea of Palaeozoic and Mesozoic successions of Triassic of Spiti, Jurassic of Kutch and Cretaceous of Tiruchirapalli;	**06**
Study of Deccan Volcanic Province.	**04**
Palaeogene – Neogene sequence of Siwalik supergroup.	**05**

Title of the Paper – **VIII. PALAEONTOLOGY**

Contact hours – 30   Total Marks 50 (UA – 40 + CA – 10) (Credit 2)

Unit-I: Lectures: 18-19	**C. hrs.**
Palaeontology: definition, Fossils: definition, characters, binomial nomenclature in taxonomy, modes of preservation of fossils, condition of fossilization and significance of fossils.	**06**
Morphology of hard parts and geological distribution of:	
Brachiopoda – *Spirifer, Productus, Terebratula*	**03**
Lamellibranchia: *Cardita, Cardium, Pectene*	**03**
Cephalopoda: *Nautilus, Goniatites*	**03**
Unit-II: Lectures: 18-19	
Morphology of hard parts and geological distribution of:	
Trilobite: *Ogygia, Paradoxide, Trinucleus*	**03**
Echinoidea: *Echinus, Micraster, Hemiaster*	**03**
Gastropoda: *Conus, Turritella, Voluta, Physa*	**03**
Evolutionary history of horse;	**03**
Morphology, distribution and significance of Gondwana flora – *Glossopteris,* and *Gangamopteris*	**03**

Books Recommended:
1. Geology of India. Wadia, D., Mc Graw Hill Book co.
2. Geology of India and Burma, 6th Edition. Krishnan, M.S., CBS Publ.
3. Fundamentals of Historical Geology & Stratigraphy of India. Ravindra Kumar, Wiley Eastern.
4. Principles of Invertebrate Paleontology. Shrock, R.R. & Twenhoffel, W.H., CBS Publ.
5. Outlines of Paleontology. Swinerton, HH., Edward Arnold Publishers
6. Paleontology: Evolution & Animal Distribution. Jain, P.C. Vishal Publications.
7. Fossil Invertebrate. Lehmann, U., Cambridge Univ. Press.
8. Organic evolution. Rastogi, Kedarnath and Ramnath Publ.
9. Palaeontology Invertebrate. Woods, Henry. CBS Publishers & Distributors.

P – III IGNEOUS PETROLOGY

Contact hours – 60   Total Marks: 100 (UA – 80, CA – 20)

Credit – 04

CC – V LABORATORY COURSE

PETROLOGY:
Study of optical properties of following minerals present in all types (igneous, sedimentary and metamorphic) of rocks: quartz, orthoclase, plagioclase, microcline, hornblende, augite, muscovite, biotite, olivine, garnet, hypersthene, calcite and chlorite.

IGNEOUS PETROLOGY:
A. Megascopic and microscopic identification and description of igneous rocks.
  1. Megascopic: granite, porphyritic granite, graphic granite, pegmatite, rhyolite, syenite, gabbro, dolerite, basalt, pitchstone / obsidian and dunite.
  2. Microscopic: granite, graphic granite, rhyolite, syenite, gabbro, dolerite, basalt and dunite.
B. Megascopic and microscopic identification and description of textures and structures of igneous rocks.
  1. Megascopic: granitic, porphyritic, graphic, glassy, flow, vesicular and amygdaloidal, columnar and pillow.
  2. Microscopic: granitic, porphyritic, graphic, glassy, intersertal (Intergranular) and ophitic.

CC – VI LABORATORY COURSE

SEDIMENTARY PETROLOGY:
A. Megascopic and microscopic identification and description of sedimentary rocks.
  1. Megascopic: conglomerate, breccia, sandstone, ferruginous sandstone, shale, arkose, grit, limestone, fossiliferous limestone, laterite and bauxite.
  2. Microscopic: sandstone, arkose, limestone, oolitic limestone and fossiliferous limestone.
B. Megascopic and microscopic identification and description of textures and structures of sedimentary rocks.
  1. Megascopic: clastic, stratification, lamellar, cross bedding, graded bedding, ripple marks and mudcracks.
  2. Microscopic: clastic, oolitic and pisolitic.

METAMORPHIC PETROLOGY:
A. Megascopic and microscopic identification and description of metamorphic rocks.
  1. Megascopic: quartzite, marble, chlorite schist, hornblende schist, mica garnet schist, granite gneiss, hornblende gneiss, augen gneiss, banded hematite quartzite slate and phyllite.
  2. Microscopic: quartzite, marble, chlorite schist, mica garnet schist, granite gneiss and hornblende gneiss.
B. Megascopic and microscopic identification and description of textures and structures of metamorphic rocks.
  1. Megascopic: granulose, schistose, gneissose, augen and slaty
  2. Microscopic: granulose, schistose, gneissose and slaty

STRATIGRAPHY:

Preparation of lithostratigraphic map of India showing distribution of important geological formations such as Dharwar, Cuddapah, Gondwana, Vindhyan and Deccan Traps.

CC – VIII LABORATORY COURSE

PALAEONTOLOGY:

Study of morphological characters of hard parts with description of fossil genera and age of following phylum:

A. PHYLUM MOLLUSCA:
   1. Class Pelecypoda (Lamellibranchia): *Cardita, Cardium and Pectene.*
   2. Class Gastropoda: *Conus, Turritella and Voluta.*
   3. Class Cephalopoda: *Nautilus, Orthoceras and Goniatites.*
B. PHYLUM BRACHIOPODA: *Spirifer, Terebratule and Productus.*
C. PHYLUM ECHINODERMATA: *Echinus, Micraster and Hemiaster*
D. PHYLUM ARTHROPODA:
   Class Trilobita: *Ogygia, Paradoxida and Trinucleus.*
E. PLANT FOSSILS: *Glossopteris and Gangamopteris*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Syllabus for B.Sc. II- Geochemistry - (IDS)

Semester System

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year- 2020 - 21

Course Structure –Total Credit 12 - (Theory (4 x 2) = 12+Practical (1 x 4) = 4)

Sr. No.	Semester	Paper No.	Title	No. of Contact Hrs/sem.	Credit Point	Total Marks (UA + CA)
1	Semester III	V	Igneous Petrology	30	02	50 = 40+10
		VI	Sedimentary and metamorphic petrology	30	02	50 = 40+10
2	Semester IV	VII	Stratigraphy	30	02	50 = 40+10
		VIII	Palaeontology	30	02	50 = 40+10
3	Semester III and IV	Practical Course	Practical Examination (Two Days) (Annual Pattern)	60	04	100 = 80 + 20
				Total	12	300 = 240 +60

IMPORTANT TO NOTE

1. 40 marks for university examinations (UA) + 10 marks internal examinations (CA) = 50 marks

2. Minimum passing percentage = 40%

3. Separate passing for both university (UA) and internal examinations (CA) in Theory and Practical examinations

2. Distribution of each Theory paper (Marks 50)

     University Assessment (UA) :40 Marks

     College Assessment (CA) :10 Marks

3. Distribution of each Practical Marks (100)

Practical examination will be conducted annually i.e. at the end of fourth semester. It will be conducted for 80 marks (UA) and 20 marks (CA).

80 (UA) + 20 (CA) = 100 marks

University Practical Examination for 80 Marks (UA):

Scheme of Marking for University Practical Examination

Total Marks: 80

Session – I

Q.No.		Marks
1	Identification and description of minerals under thin section. Table 1 to 5	**10**
2	Identification and description of fossils kept on table nos. 6 to 15	**10**

Session – II

3	Microscopic identification and description of rocks from table no. 1 to 5	**10**
4	Identification and description of rocks megascopically from table no. 6 to 15.	**10**

Session – III

5	Microscopic identification and description of textures and structures of rocks from table no. 1 to 3	**06**
6	Identification and description textures and structures of rocks megascopically from table no. 4 to 13.	**10**
7	Identify and mark following two geological formations on the Map of India. Table nos. 14 and 15 1. _____ 2. _____	**04**
8	Certified Journal	**10**
	Field work report / Project / Seminar / Group discussion / Oral	**10**
	Total	**80**

Practical Record

- Certified record of the practical done by the student should be maintained as a journal and must be submitted at the time of annual practical examination.
- Certified report of Field visit / Project / Oral / Seminar / Group discussion should be submitted before annual practical examination.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Mathematics

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

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

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, Laplace transformation, 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 100 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.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology
Choice Based Credit System (CBCS)
(w.e.f.2020-21)
Draft 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 (*Students can opt any Three subjects among the Four	C-5		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
subjects offered at B.Sc.I. Out of Three Subjects offered One	C-6		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
Subject will be the Core Subject **OR**	C-7		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
		SEC-1								
		GE-3								
Grand Total				18	--	--	300	240	60	12
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 Elective Subject	C-8		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-9		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-10		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
		SEC-2								
		GE-4								
		Environmental Studies		3.0	--	--	50	40	10	NC
Total (Theory)				21	--	--	350	280	70	12
Practical	C-5 & C-8		Pr. III&IV	--	--	8	100	80	20	4.0
	C-6 & C-9		Pr. III&IV	--	--	8	100	80	20	4.0
	C-7 & C-10		Pr. III&IV	--	--	8	100	80	20	4.0
	GE-3 & GE-4									
Total (Practical)						24	300	240	60	12
Grand Total				39		24	950	760	190	36

*Core SubjectsChemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology Core Subjects- (Additional)-Geochemistry/Biochemistry/ Meterology/Plant Protection

Summary of the Structure of B.Sc. Programme
as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practicals	Total – credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	300	12	24
Total		650	24	300	12	36

B.Sc. Programme :
Total Marks : Theory + Practical's = 650 +300   =950
Credits   : Theory + Practical's = 12 + 24   = 36
Numbers of Papers Theory: Ability Enhancement Course (AECC)   : 00
                                    Theory: Discipline Specific Elective Paper (DSE) : 00
                                    Theory: CC   : 06
                                    Skill Enhancement Courses   : 00
                                    GE   **:** 00
Total   : Theory Papers   :
             : Practical Papers   :

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology
Syllabus for B.Sc.II-Mathematics
Semester System
Choice Based Credit System (CBCS) Pattern
To be implemented from Academic Year 2020 -21

1. Course Structure:

Sr. No	Semester	Paper No.	Title	No. of Lectures	Credit Point	Total Marks
1.	Semester-III	V	Differential Calculus	45	2	50
		VI	Laplace Transform	45	2	50
2.	Semester-IV	VII	Differential Equations	45	2	50
		VIII	Abstract algebra-I	45	2	50
3.	Semester III and IV (Annual)		Numerical Techniques in Laboratory[NTL-II A & B] Practical Course (Annual)		4	100
			Total Marks		12	300

2. Distribution of each Theory paper (Marks 50)
University Assessment (UA) : 40 Marks
College Assessment (CA)   : 10 Marks
Scheme of College Assessment
  1. Unit Test   : 05 Marks
  2. Home Assignment   : 05 Marks

3. Distribution of Practical Marks (100)
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 (80) Marks: (UA)
   a) Problems from paper-V   15:
   b) Problems from paper-VI   15:
   c) Problems from paper-VII   15:
   d) Problems from paper-VIII   15:
   e) Journal   20:

B. Practical : Internal Continuous Assessment (20 marks)
Scheme of Marking: **10 Marks:** Internal Test on any four practicals,

   10Marks: 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).   **[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
and three 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
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

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. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. ,B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus , Phadke Prakashan Kolapur .

   3. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
   4. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow
   5. P. N. Wartikar and J. N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
   6. Tom M. Apostol, Calculus Vol I and II, Wiley Publication.

Unit 1: Laplace Transform. [15]

Integral Transform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of F(t), Laplace Transform of the nth order derivatives of F(t), Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t, Multiplication by t^n, Division by t, Evolution of Integrals, periodic functions.

Unit 2: The Inverse Laplace Transform. [15]

Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p, Division by powers of p, Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.

Unit 3: Application of Laplace Transforms. [15]

Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients .Partial differential equation

Recommended Books for Paper – VI (Integral Transform):

Integral Transform by *Vasistha* A.R., Gupta R.K., Krishna Prakashan *Media Pvt. Ltd. 11. Shivaji Road, Meerut India.*

Unit 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21.

Unit 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17

Unit 3: 3.1, 3.2, 3.4,

Reference Books:

1. The Laplace Transform by Rainville E.D.

2. Integral Transform byDr. J.R. Goyal and K.P. Gupta, Pragati Prakashan Meerut.

3. Differential equation by Sharma and Gupta, Krishna Prakashan Media Co.Meerut

4. Integral Transform and their Applications by Lokenath Debnath, CRC Press.

5. An introduction to Lapace Tranforms and Fourier series by Phill Dyke , Springer publication.

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
Nature of the solution of simultaneous equations, Rules of solving the Equation,

Unit 5. Total Differential Equations
  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):6.1, 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. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. , B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Equation, Phadke Prakashan Kolapur .

3. Differential Equation by Murrey.
4. Differential Equation by Diwan and Agashe
5. Differential Equation by Sharma-Gupta, Krishna Prakashan Media (Pvt.) Ltd, Meerut

Paper –VIII (Abstract Algebra)

Unit-1: Introduction to Groups   **[10]**
Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

Unit -2: Equivalence, Congruence, Divisibility   **[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. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. B. Sc. – II (Mathematics) Semester-III, Paper VIII: Abstract Algebra -I, –, Phadke Prakashan Kolapur
3. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education 7th edition.
4. University Algebra N.S. Gopalkrishnan.
5. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
6. 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 , Laplace transforms, 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: Laplace Transform

Assignment No. 6: Inverse Laplace Transform I

Assignment No. 7: Inverse Laplace Transform II

Assignment No. 8: Application of Laplace Transform

[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

With Effect from June -2020
Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-V : Differential Calculus	Paper-V :Differential Calculus
2)	Paper-VI: Real Analysis	Paper-VI: Laplace Transform
3)	Paper-VII: Differential Equation	Paper-VII: Differential Equation
4)	Paper-VIII : 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: Microbiology

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

Faculty of Science and Technology

Choice Based Credit System (CBCS)

(w.e.f. 2020-21)

Structure for B.Sc. II Microbiology (Semester III & IV)

Subject/ Core Course	Name and Type of the Paper		No. of Papers/ Practicals	Hrs / Week			Total Marks per paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	B.Sc. II Semester III									
	Core	C5	Paper – V Bacterial Cytology and Physiology	3.0	-	-	50	40	10	3.0
	Core	C6	Paper – VI Bacterial Genetics	3.0	-	-	50	40	10	3.0
Total				6.0			100	80	20	6.0
Class:	B.Sc. II Semester IV									
	Core	C7	Paper VII Immunology & Medical Microbiology	3.0	-	-	50	40	10	3.0
	Core	C8	Paper VIII Industrial Microbiology	3.0	-	-	50	40	10	3.0
	Ability Enhancement Course (AECC)	Environmental Studies		3.0	-	-	50	40	10	3.0
Total (Theory)				9.0	-	-	150	120	30	9.0
Practical	Core	C5 & C6	Paper V& VI	-	-	4.0	50	40	10	4.0
	Core	C7 & C8	Paper VII & VIII	-	-	4.0	50	40	10	4.0
Total Practical				-	-	8.0	100	80	20	8.0
Grand Total (Semester III & IV with Practicals)				15.0	-	8.0	350	280	70	23.0

Paper – V Bacterial Cytology and Physiology		
THEORY COURSE (03 Credits)		
		Total Lectures 45L
Unit No.	Content of Unit	Lectures Allotted
I	**Ultra-structure and Functions** 1. **Bacterial Cell wall**: chemical composition, structure and functions of cell wall of Gram Positive and Gram Negative bacteria 2. **Cell Membrane**: Chemical Composition, structure and functions. Transport across cell membrane – simple diffusion, facilitated diffusion, active transport & group translocation. 3. **Mesosome** & its functions**.** 4. **Flagella**: Structure and functions , Mechanism of movement, Tactic behaviors 5. **Pili**: Types, Structure and functions 6. **Cytoplasmic inclusions**: Chlorobium vesicles. Gas vacuoles, Magnetosomes and carboxysomes and their functions 7. **Reserve Food Materials**: Nitrogenous and Non nitrogenous and their role 8. **Bacterial Endospore**: Ultra-structure and functions, sporulation as an example of cell differentiation, Germination of endospore	15 L
II	**Bacterial Growth** 1. Definitions of - growth, generation time, growth rate and Synchronous Growth 2. Growth phases 3. Measurement of growth – Cell numbers, Cell Mass and Cell activity	07 L
III	**Effect of Environmental factors on Bacterial growth** 1. **Temperature** Psychrophiles, Mesophiles, Thermophiles, Thermodurics 2. **pH-** Acidophiles, Basophiles and Neutrophiles 3. **Oxygen-** Aerobic, Anaerobic, Facultative Anaerobic and Microaerophilic 4. **Osmotic pressure-** Osmophilic(Halophilic) 5. **Hydrostatic Pressure-** Barophiles 6. **Surface Tension**	10 L
IV	**Bacterial Metabolism** 1. **Fates of Pyruvate** – a) Aerobic Tri-Carboxylic Acid Cycle b) Anaerobic – Ethanol Fermentation c) Microaerobic – Lactic Acid Fermentation 2. **Modes of ATP generation** – a. Substrate Level Phosphorylation, b. Oxidative Phosphorylation - Respiratory electron transport chain, components of ETC, aerobic and anaerobic respiration c. Photophosphorylation: photosynthetic ETC [cyclic & noncyclic]	13 L

Reference Books:

1] Powar C.B. and Daginawala H.F. (1986). General Microbiology Vol. I & II
   (2ndEdition), Himalaya Publishing House, Mumbai.
2] Stanier R.Y, *et.al;* General Microbiology
3 Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata
   Mc Graw Hill Publishing Co., Ltd., New Delhi
4] Dubey, R.C and Maheswari, D.K. (2000) General Microbiology. S. Chand, New Delhi.

Paper-VI Bacterial Genetics

THEORY COURSE (03 Credits)   (45 L)

Unit No.	Content of Unit	Allotted Lectures
Unit-I: Structure of nucleic acids & Replication of Bacterial DNA	1.Experimental evidenences for nucleic acid as genetic material- • Griffith Experiment • Avery, Macleod and McCarty's experiment • Hershey and Chase experiment 2. Structure & forms or types of DNA- • Watson and Crick's model of DNA • A, B ,C and Z form of DNA 3.DNA replication- • Modes of replication (Conservative, semoconservative and Dispersive) • Messelson & Stahl's experimental proof of semoconservative replication • Enzymes involved in replication • Mechanism of DNA replication	12
Unit –II: Gene, Genetic code and Plasmid	1. Definitions and concepts of - • Gene • Genome • Genotype • Phenotype • Cistron, Recon & Muton • Split gene-concept of intron and exons 2. Genetic code- • Definition and properties of genetic code 3. Plasmid- • Definition of plasmid and episome • Properties of plasmid • Types of plasmid-F plasmid, R plasmid, Col plasmid, Ti plasmid, Linear plasmid and Yeast 2µ plasmid • Applications of plasmid	09
Unit-III: Bacterial Mutation & Repair	1.Mutations & Mutagenesis- • Definition of mutation • Mutagen- physical and chemical Mutagens 2. Types of mutation- • Base pair Substitution- Transition and Transversion • Missense mutation • Nonsense muataion • Neutral Mutation • Silent Mutation • Frame shift Mutation	12

	3. Types of mutation on the basis of molecular mechanism- • Spontaneous Mutation- Definition, Fluctuation Test, Replica plate technique • Definition and Mechanism of Induced Mutations caused by- • Physical Mutagen- U.V.rays • Chemical mutagens- 5-Bromouracil, 2-aminopurine, Hydroxylamine, Nitrous acid, alkylating agent and Acridine dyes. 4. DNA repair- • Photo reactivation • Dark repair Mechanism-Excision repair (Base and Nucleotide)	
Unit- IV Bacterial Recombination	1. Definition of recombination 2. Fate of exogenote 3.Types of recombination- • Transformation- experimental proof & mechanism of transformation, Definition of transfection • Conjugation- a)Discovery, experimental evidence (Leaderberg & Tautum's & Davis U Tube) b) Mechanism of conjugation- F+ X F-, HFr X F-, F'X F- • Transduction- a) Discovery & experimental proof (Zinder & Leaderberg) b) Types of transduction- Specialized, Generalized and Abortive transduction.	12

References:

1] A J Salle: Fundamentals of Bacteriology

2] R Y Stainer, Roger et.al: General Microbiology

3] Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi

4] Powar and Daginawala: General microbiology Vol. I, II, Himalaya Publishing House

5] Avinash and Kakoli Upadhay: Molbio, Himalaya Publishing House

6] Freifelder David: Microbial genetics, Jones and Bartlett Publications

7] James D Watson: Molecular biology of the gene, W. A. Benjamin, Inc.

Semester IV

	Paper-VII Immunology & Medical Microbiology	
	THEORY COURSE (03 Credits)	
		Total Lectures 45L
Unit No.	**Content of Unit**	**Lectures Allotted**
Unit I: Immunity	1. Immunity – Definition and concept 　　a. Innate immunity – Definition, Levels of innate immunity – Individual, racial and species immunity , Mechanism of innate immunity-mechanical, chemical, biological barriers[role of normal flora, cells of innate immunity and their role], inflammation and fever 　　b. Acquired immunity – definition,　types-Active & passive	(12)
Unit II: Antigen & Antibody	1. Antigen a.definition,concept of hapten,antigenic determinant, b.Types of antigen c.factors affecting antigenicity 　2. **Antibody** (immunoglobulin) 　　**a. Historical perspective-**Immune sera and concept of immunoglobulin 　　b. Basic structure of antibody (immunoglobulin) 　　c. Classes of immunoglobulins, physicochemical & biological properties and functions　of Immunoglobulins.	(12)
Unit III: Antigen – antibody reactions	1. Purposes of antigen antibody reactions 　2. General features antigen antibody reactions 　3.　Measurement of antigen antibody reactions 　4. Mechanism antigen antibody reactions 　5. Types of antigen – antibody reactions: Agglutination test, precipitation test, flocculation test, complement fixation test, Immunofluorescence test	(09)
Unit IV- Microbial Diseases Clinical Microbiology	**A. Microbial Diseases** 1.Bacterial Infections- Enteric fever, Staphylococcl wound infections and Urinary tract infections 2.Fungal Infection-Candidiais 3.Viral Infection- Dengue fever **B. Clinical Microbiology** 1.Basic concepts 2.Collection, handling & transportation of specimen 3. Methods of diagnosis of diseases- Microscopic, cultural, biochemical & Serological.	(12)

Reference Books:

1. Ananthanarayana R. and Paniker, C.K.J. (2000). Text Book of Microbiology, 9th Edition, Oriental Longman Publications, USA.
 2. Roitt, I.M. (1998). Essentials of Immunology, ELBS and Black Well Scientific Publishers, England.
3. Prescott, M.J., Harley, J.P. and Klein, D.A. (2002). Microbiology. 5th Edition, WCB McGrawHill, New York.
4. Dugid,J.P.,Medical Microbiology
5. Kubey - Immunology

Semester -IV

Unit No.	Content of Unit	Lectures Allotted
Paper VII: Industrial Microbiology		
THEORY COURSE (03 Credits)		
		Total Lectures 45L
UnitI: Industrial Microbiology	1. Definition and Scope of industrial Microbiology, industrial important organisms with products (lists) 2. Fermentations: Basic Concept, Types –Surface Culture Submerged Culture. Batch, Continuous culture (Chemostat & Turbidostat) , Dual and Multiple fermentation. 3. Design of typical Fermenter / Bioreactor: Parts and their functions	**(10)**
UnitII: Fermentation Media	1. Media for industrial Fermentations 2. Media Components and Optimization 3. Use of Waste as a fermentation Media 4. Inoculum and Production media	**(12)**
Unit III: Screening, Inoculum Development and Scale up	1. Screening: Primary and Secondary 2. Strain Improvement 3. Preservation of industrially important microorganisms 4. Inoculum Development 5. Scale up of Fermentation	**(09)**
Unit IV: Specific Fermentations & Fermentation Product Recovery	**a) Specific Fermentations** **1.** Penicillin fermentation (*P.chrysogenium*) 2.Alcohol (*S.cerevisiae*) 3. SCP (*S.cerevisiae*) 4.Amylase (A.niger) **b) Fermentation Product Recovery** 1. Criteria for selection of recovery method 2. Filtration, Centrifugation, Precipitation, Distillation, Crystallization and Drying.	**(14)**

Reference Books:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.

2. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age

   International Ltd., New Delhi.

3. Prescott & Dunn, Industrial Microbiology

4. Purohit, Microbiology- Fundamentals and Applications, sixth edition

5. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition,Elsevier Science Ltd.

B. Sc. II Microbiology

Practical Course   (Credits - 08)

1. Stains and Staining Procedures

     i. Spore Staining [Dorner's method]

     ii. Flagella Staining [Bailey's Method]

     iii. Nuclear material Staining [Giemsa's method]

2. Preparation of culture media

     a. Wilson and Blair's medium

     b. Gelatin Agar

     c. Amino Acid Decarboxylation Medium

     d. Peptone Nitrate Broth

     e. Hugh and Leifson's Medium

     f. Amino Acid Deamination medium

     g. Christensen's urea agar

3. Preparation of Reagents and Solutions

     a. 1N NaOH

     b. 1N HCl

     c. 10% Ferric chloride

     d. Nitrate reduction test reagents (α naphthylamine & Sulphanilic acid)

     e. 1% Tannic acid

     f. Phosphate buffer solution of pH 7.0

     g. Benedict's reagent

     h. Biuret reagent

4. Biochemical Tests

     a. Gelatin Hydrolysis

     b. Amino Acid Decarboxylation

     c. Amino Acid Deamination

     d. Urea Hydrolysis

     e. Nitrate Reduction

f. Oxidase

g. Hugh and Leifson's

h. Catalase

5. Effect of environmental factors on growth of microorganisms

a. UV light

b. Heavy Metals

c. Salt Concentration (NaCl)

d. pH

e. Temperature

f. Antibiotics [Penicillin & Streptomycin]

6. Primary Screening:

a. Antibiotic Producers – Crowded Plate Technique

b. Amylase Producers – Replica Plate Technique

7. Isolation & Identification of Pathogenic Microorganisms from Clinical Samples

a. *Salmonella* spp.

b. Candida spp.

c. Proteus spp.

8. Determination of Blood Groups – ABO & Rh

9. Widal test (slide test): Qualitative

10. Glucose Estimation (Benedict's Method).

11. Protein Estimation (Biuret Method).

12. Study of Growth phases of *E.coli* by optical density method.

13. Isolation of DNA

Practical Question Paper for University Practical Examination

Total Marks: 80

Q.1 Identification of Pathogen   20

Q.2 Biochemical Tests   10

Q.3 Staining / Screening   10

Q.4 Effects/ Growth Curve [lag phase]   10

Q.5 Glucose /Protein / Widal test/ Blood Groups   10

Q.6 Spotting on Media components, reagents and stains

  (05 Spots)   10

Q.7 Journal   05

Q.8 Tour Report   05

The practical Examination will be conducted for two (2) successive days for 6 hours each day. There will be one batch of maximum 20 students each day.

Internal Practical examination:

Total Marks: 20

The internal practical examination shall be as per scheme given by Faculty of Science.

Practical Examination will be conducted at the end of Semester IV

References for Practical course

1] Cappuccino, J.G. and Sherman, N. (2005). Microbiology – A Laboratory Manual. 7th
   Edition. Pearson Education. Published by Dorling Kindersley (India) Pvt. Ltd.

2] Mukherjee, K.L. (1996). Medical Laboratory Technology. Vol II. Tata Mc GrawHill
   Publishing Co. Ltd., New Delhi

3] Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co.,
   New Delhi

4] Naik Sandesh, Handbook of Practical microbiology

6] Frobisher, H., Hinsdil, R.D., Crabtree, K.T. and Goodhert, D.R. (2005)
   Fundamentals of Microbiology, Saunders and Company, London.

7] K.R.Aneja, Pranay Jain, Raman Aneja (2008). A Textbook of Basic and Applied
   Microbiology, New Age International Publishers

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

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]**

4.1 Concept of Polarization

4.2 Double refraction and

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

4.4 Nicol'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.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ZOOLOGY

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

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

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Background of Curriculum:

In accordance with the UGCs reference to standardize curricula at the national level and bring a match across all the Indian Universities, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template.

Zoology deals with the study of animal kingdom specially the structural diversity, biology, embryology, evolution, habits and distribution of animals, both living and extinct. As it covers a fascinating range of topics, the modern zoologists need to have insight into many disciplines. The learning outcomes-based curriculum framework for a B.Sc. degree in Zoology is designed to cater to the needs of students in view of the evolving nature of animal science as a subject. The framework is expected to assist in the maintenance of the standard of Zoology degrees/programmes across the country by reviewing and revising a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework, however, does not seek to bring about uniformity in syllabi for a programme of study in Zoology, or in teaching learning process and learning assessment procedures. Instead, the framework is intended to allow for flexibility and innovation in programme design and syllabi development, teaching learning process, assessment of student learning levels. A comprehensive knowledge of structure-function relationship at the level of gene, genome, cell, tissue, organ, and systems, through development would further add to the knowledge base and the learning outcome in terms of editing of genes and genomes for industrial application and research purposes.

Learning Outcomes based approach to Curriculum Planning:

The courses should be delivered in terms of concepts, mechanisms, biological designs & functions and evolutionary significance cutting across organisms at B.Sc. level. These courses should be studied by students of all branches of biology. Both chalk and board, and PowerPoint presentations can be used for teaching the course. The students should do the dissertation/ project work under practical of different courses, wherever possible.

The students are expected to learn the courses with excitements of biology along with the universal molecular mechanisms of biological designs and their functions. They should be able to appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how contributions from research and innovation have made the subjects modern, interdisciplinary and applied and laid the foundations of Zoology, Animal Sciences, Life Sciences, Molecular Biology and Biotechnology. These courses and their practical exercises will help the students to apply their knowledge in future course of their career development in higher education and research. In addition, they may get interested to look for engagements in industry and commercial activities employing Life Sciences, Molecular Biology and Biotechnology. They may also be interested in entrepreneurship and start some small business based on their interest and experience.

Graduate Attributes in Zoology:

- Disciplinary knowledge and skills: Capable of demonstrating (i) comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (ii) ability to use modern instrumentation for advanced genomic and proteomic technology.

- Skilled communicator: Ability to impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills.

- Critical thinker and problem solver: Ability to have critical thinking and efficient problem solving skills in the basic areas of Zoology

- Sense of inquiry: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

- Team player/worker: Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

- Skilled project manager: Capable of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

- Digitally literate: Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

- Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

- Lifelong learners: Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling

Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level. The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

• Outline of Choice Based Credit System:

1. *Core Course:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. *Elective Course:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. *Ability Enhancement Courses (AEC):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• Credit: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

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 Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR	C-5		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
	C-6		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
	C-7 (Zoology)	**Paper-V: Cell Biology**		**3.0**	**--**	**--**	**50**	**40**	**10**	**4.0**
		Paper-VI: Principles of Ecology		**3.0**	**--**	**--**	**50**	**40**	**10**	
		SEC-1								
		GE-3								
Grand Total				18	--	--	300	240	60	12
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 will be Elective	C-8		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-9		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-10 (Zoology)	**Paper-VII Fundamentals of Biochemistry**		**3.0**	**--**	**--**	**50**	**40**	**10**	
		Paper-VIII Physiology-Control & Coordination		**3.0**	**--**	**--**	**50**	**40**	**10**	**4.0**

Subject									
	SEC-2								
	GE-4								
	Environmental Studies		3.0	--	--	50	40	10	NC
Total (Theory)			21	--	--	350	280	70	12
Practical	C-5 & C-8	Pr. III&IV	--	--	8	100	80	20	4.0
	C-6 & C-9	Pr. III&IV	--	--	8	100	80	20	4.0
	C-7 & C-10 (Zoology)	**Pr. I: (Cell Biology & Principles of Ecology) & Pr. II: (Fundamentals of Biochemistry & Physiology-Control & Coordination)**	--	--	**8**	**100**	**80**	**20**	**4.0**
	GE-3 & GE-4								
Total (Practical)					24	300	240	60	12
Grand Total			39		24	950	760	190	36

*Core Subjects

Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology

Core Subjects- (Additional)-Geochemistry/Biochemistry/Meteorology/Plant Protection

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practicals	Total – credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	300	12	24
Total		650	24	300	12	36

B.Sc. Programme :

Total Marks : Theory + Practical's = 650 +300   =950

Credits   : Theory + Practical's = 12 + 24   = 36

Numbers of Papers   Theory: Ability Enhancement Course (AECC)   : 00

                Theory: Discipline Specific Elective Paper (DSE)   : 00

                Theory: CC   : 06

        Skill Enhancement Courses   : 00

        GE   : 00

Total   : Theory Papers   :

: Practical Papers   :

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

PAH SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science
Choice Based Credit System (CBCS)
(W.e.f. 2020-21)

• 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.

•   **Course outcome and Advantages:** Zoology has tremendous job potential. The successful students will be able to establish research organizations 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.

• Medium of Instruction: English
• Syllabus Structure:
• The University follows semester system.
• An academic year shall consist of two semesters.
• B.Sc. Part-II Zoology shall consist of two semesters: Semester III and Semester IV

In semester III: there will be two DSC papers having paper V and paper VI of 100 marks. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** Environmental Studies

In Semester IV: there will be two DSC papers having paper VII and paper VIII of 100 marks.

The scheme of evaluation of performance of candidates shall be based on **University Assessment (UA)** as well as **College Internal Assessment (CA)** as given below.

For B.Sc.Part-II Zoology Sem III & IV the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

• **Practical course examination** is of 100 marks shall be conducted at the end of semester II. The

practical examination of 100 marks shall also consist of **80 marks for University practical assessment** and **20 marks for college internal assessment (CA)**.

• **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 20 marks and external evaluation (University assessment) of 80 marks.

Semester – III: Theory: (100 marks): Comprising DSC-

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper V and paper VI of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper V and paper VI of 10 marks each)

c) **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** Environmental Studies

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

Semester – IV: Theory: (100 marks): Comprising DSC-

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper VII and paper VIII of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper VII and paper VIII of 10 marks each)

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
Practical Examination: (100 marks)
University Examination (80 marks): No. of practicals': 02

Practical-I: Based on papers V & VI :   (40 UA + 10 CA)
Practical-II: Based on papers VII & VIII   :   (40 UA + 10 CA)

Internal Continuous Assessment: (20 marks): Practical-I (10) + Practical-II (10)

(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 80 marks (Practical I & II for two separate days) will be conducted at the end of semester IV

Passing Standard:

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade.

9

Such student will have to reappear 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 reappear 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 of external examination and his performance shall be scaled to 100 marks.

• **ATKT:**

Candidate passed in all papers, except 5 (five) papers combined together of semester I and II of B.Sc. Part-I Zoology examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Zoology

B.Sc .II Semester-III & IV, ZOOLOGY
Choice Based Credit System (CBCS) Structure (2020-21)
Semester- III (Theory)

Paper	Title	Marks
V	Cell Biology	50 (40- UA and 10-CA)
VI	Principles of Ecology	50 (40- UA and 10-CA)

Semester- IV (Theory)

Paper	Title	Marks
VII	Fundamentals of Biochemistry	50 (40- UA and 10-CA)
VIII	Physiology-Control & Coordination	50 (40- UA and 10-CA)

PRACTICALS

PRACTICAL	Title	Marks
I	Cell Biology & Principles of Ecology	50 (40- UA and 10-CA)
II	Fundamentals of Biochemistry & Physiology Control & Coordination	50 (40- UA and 10-CA)
	Total Marks	100 (80-UA + 20-CA)

Paper-V

CELL BIOLOGY: THEORY (Credits-02 & contact hours-30)

Unit 1:   **Overview of Cells**   02
Prokaryotic and Eukaryotic cells, Virus, Viroids

Unit 2:   **Plasma Membrane**   03
Singer & Nicholson's model of plasma membrane. Transport across membranes:
An overview of active and passive transport

Unit 3:   **Endomembrane System**   06
Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes

Unit 4:   **Mitochondria**   04
Mitochondria: Ultrastructure, Semi-autonomous nature, Endosymbiotic hypothesis
Mitochondrial Respiratory Chain, functions.

Unit 5:   **Cytoskeleton**   04
Structure and Functions: Microtubules, Microfilaments

Unit 6:   **Nucleus**   05
Structure and functions of Nucleus, Nuclear envelope, Nuclear pore complex,
Nucleolus, Chromatin: Euchromatin, Hetrochromatin and nucleosome

Unit 7:   **Cell Division**   04
Cell cycle, Mitosis and Meiosis

Unit 8:   **Cell Signaling**   02
•   Types of cell signaling , Brief idea of G-Protein Coupled Receptor (GPCR) and
Role of secondary   messengers (cAMP)

SUGGESTED READINGS

1) Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
2) De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3) Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
4) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
5) Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008).

Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

Learning outcomes : Students will come to know about:

- Cellular architecture & their functions at organismic level
- This knowledge will help students in future to explore areas like: oncology, medical diagnostics and treatment
- Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
- Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
- Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
- Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.

Paper-VI

PRINCIPLES OF ECOLOGY: THEORY (Credits-02 & contact hours-30)

Unit 1:   **Introduction to Ecology**   **02**
History of ecology, Autecology and synecology

Unit 2:   **Population Ecology**   **05**

Brief idea about attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves.

Unit 3:   **Animal Associations-** Brief idea and definitions   **05**
- Intraspecifc associations: Parental care in fishes, groupism and social behavior
- Interspecific associations: commensalism, mutualism, predation and parasitism

Unit 4:   **Abiotic Factors**   **03**

Introduction & Effects on animals: Temperature, light, water, water hardness, humidity, soil, oxygen and carbon dioxide.

Unit 5:   **Community**   **04**

Community characteristics: species richness, dominance, diversity indices, abundance.

Unit 6:   **Ecosystem**   **05**

General characteristics & faunal adaptations in:

- Aquatic (freshwater ecosystem: lotic and lentic) &
- Terrestrial (grassland and desert ecosystem).

Unit 7:   **Food chain:**   **04**

Pond ecosystem: with reference to food chain, ecological pyramid, energy flow and ecological succession

Unit 8   **Applied Ecology**   **02**

Brief idea of: Biodiversity hot-spots and sacred groves in India with examples

SUGGESTED READINGS:

1) Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2) Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3) Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4) Robert Leo Smith Ecology and field biology Harper and Row publisher
5) Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

Learning Outcomes (LO): Students will come to know about

- Ecological principles & applications that govern the planet Earth
- This knowledge will help students in future to explore areas like: biodiversity, conservation biology, forestry & natural resource management
- Know the evolutionary and functional basis of animal ecology.
- Understand what makes the scientific study of animal ecology a crucial and exciting endeavor.
- Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
- Analyze a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.

Semester-IV

B.Sc.-II Zoology (CBCS): Semester-IV

PAPER-VII: FUNDAMENTALS OF BIOCHEMISTRY

THEORY (CREDITS 2; Contact Hours-30)

Unit 1:   **Carbohydrates**   **(04)**
Structure and biological Significance of: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates

Unit 2:   **Lipids**   **(04)**
Structure and biological Significance of: Physiologically important of saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids

Unit 3:   **Amino Acids**   **(03)**
Amino acids: Structure, Classification and General Properties of α-amino acids;

Unit 4:   **Proteins:**
Levels of organization in proteins (primary, secondary, tertiary & quaternary); Simple and conjugate proteins with examples   **(02)**

Unit- 5:   **Immunoglobulins:**
Basic Structure, Classes and biological significance   **(02)**

Unit 6:   **Nucleic Acids**   **(04)**
Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids: Base pairing, Denaturation and Renaturation of DNA; Types of DNA and RNA.

Unit 7:   **Central Dogma**
Basic concepts of replication, transcription and translation in prokaryotes   **(04)**

Unit 8:   **Enzymes**   **(07)**
Nomenclature and classification; Co-factors; Properties of enzymes; Mechanism of enzyme action; Factors affecting enzyme actions; Enzyme inhibition, Isozymes

Learning Outcome:

After successfully completing this course, the students will be able to:

- Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.

- Understand the structure and function of immunoglobulins.

- Understand the concept of enzyme, its mechanism of action and regulation.

- Understand the process of DNA replication, transcription and translation.

- Learn the preparation of models of peptides and nucleotides.

- Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.

- Learn measurement of enzyme activity and its kinetics.

PAPER-VIII
ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

THEORY (CREDITS 2; Contact Hours-30)

Unit 1: **Tissues** **(04)**
Structure, location, classification and functions of: epithelial tissue, connective tissue, muscular tissue and nervous tissue :
Blood –Types of blood cells(RBC,WBC ,Platelets , Plasma) , functions of blood

Unit 2: **Histology of following mammalian organs:** **(04)**
i) Tooth   ii) Salivary gland   iii) Stomach   iv) IIeum
v) Liver   vi) Pancreas vii) Kidney viii) Testis   ix) Ovary

Unit 3: **Nervous System** **(04)**
Ultastructure of neuron, resting membrane potential, origin of action potential and its propagation across the nerve fibers; Structure of Synapse and Synaptic transmission,

Unit 4: **Muscle** **(03)**
Types of muscles (smooth, Striated, cardiac) and Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction.

Unit 5: **Reproductive Physiology** **(03)**
Pituitary gland & its hormones, Sex hormones (male & female)

Unit 6: **Reproductive Cycle** **(04)**
Oestrous and Menstrual cycle, Hormonal control of pregnancy, parturition and lactation; Contraception methods: Physical, oral contraceptives pills, IUD, surgical methods

Unit 7: **In-vitro Fertilization** **(02)**
Technique of IVF and its applications

Unit 8: **Endocrine System** **(06)**
Histology, hormonal secretions & their functions and disorders of following endocrine glands- Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal.

*Note: With reference to mammals.

Learning outcomes:

After successfully completing this course, the students will be able to:

- Acquire knowledge of the coordinated physiological functioning

- Realize that very physiological mechanisms are used in very diverse organisms.

- Understand how cells, tissues, and organisms function at different levels.

- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc
- Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
- Undertake research in any aspect of animal physiology in future.

REFERENCES:

CELL BIOLOGY:

- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

ECOLOGY:

- Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

FUNDAMENTALS OF BIOCHEMISTRY:

- Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.
- Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Pub.

PHYSIOLOGY: CONTROL & COORDINATION:

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII

Edition. Lippincott W. & Wilkins.

PAH Solapur University, Solapur, Faculty of Science
Choice Based Credit System (CBCS)
B.Sc.-II Zoology
(2020-2021 : w.e.f. June 2019) **

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Practical-I (Paper-V & VI): Cell Biology and Principles of Ecology (04 Credits)

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.

2. Study of various stages of meiosis in onion flower buds.

3. Demonstration/ Observation of Barr body using permanent slide(s) *(spotter)*

4. Study of principle and procedure and technique using permanent slide *(spotter)*
i) DNA by Feulgen technique.
ii) Mucopolysaccharides by Periodic Acid Schiffs Reaction (PAS)

5. Study and construction of ecological pyramid from given data:
i) Members of Grass land ecosystem –
Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard.
ii) Members of Pond ecosystem –
Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra.

6. Calculation of Shannon-Weiner diversity index from the given data/ model.

7. Study of an aquatic ecosystem: Identification of Zooplankton with the help of permanent slides (*Spotters*),
 8. Estimation of Dissolved Oxygen (Winkler's method) from given sample,
 9. Estimation of Carbondioxide (CO_2) from given sample.
 10 .Estimation of Total Hardness content from given sample.

 11 Study Visit: Report on a visit to National / Central / State institutes / Local water bodies/National Park/Biodiversity Park/Wild life sanctuary.

Practical-II
(Paper-VII & VIII):

FUNDAMENTALS OF BIOCHEMISTRY and ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS (CREDITS-04) **

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.

2. Estimation of protein by colorimetric method.

3. Estimation of carbohydrates by colorimetric method.

4. Demonstration of paper chromatography of amino acids.

5. Action of amylase or papain enzyme under optimum conditions.

6. Effect of pH, temperature and inhibitors on the action of amylase.

7. Demonstration of proteins separation by SDS-PAGE.

8. Recording of simple muscle twitch/ Cardiogram – demonstration. (Virtual frog/ computer generated)
(Analysis of given graph of Frog- muscle twitch or cardiogram In the examination
students are provided with any one computer generated graph and supposed to
'Analyze the given graph and explain details of principle, procedure, result,
Inference and viva-voce based on the given practical is expected)

9. Study of permanent slides (T.S./V,S.) - of Mammalian organs using permanent slides:
 i) Tooth   ii) Salivary gland   iii) Stomach   iv) IIeum v) Liver   vi) Pancreas vii) Kidney
viii) Testis   ix) Ovary

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

11. Microtomy: Study of principle , procedure and mechanism of micro-technique and microtome :
flow chart of technique, study of procedure and observation of HE staining technique/ whole mount
using permanent slides (study of protocol using flowchart).

12. Study visit: Visit to wetlands, medical college, pathology laboratory and blood bank

OR

13. Preparation and submission of small project/ review on topics related to ecology, cell biology,
biochemistry and physiology

Skeleton paper for practical examination
(University Examination for 40 Marks)

Practical-I (Paper-V & VI) Cell Biology and Principles of Ecology		
Questions		**Marks**
Q-1:	Preparation of temporary stained squash of onion root tip to study various stages of mitosis *OR* Study of various stages of meiosis in onion flower buds.	08
Q-2:	Estimation from given sample - of Dissolved Oxygen (Winkler's method) **OR** Carbondioxide (CO_2) *OR* Total Hardness content	08
Q:3:	Study and construction of ecological pyramid from given data: *i) Members of Grass land ecosystem –* Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard. **OR** *ii) Members of Pond ecosystem –* Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra.	08
Q:4	Spotting / Identification (Any four) Zooplankton with the help of permanent slides (chart/ model /photo) / Bar body (*Spotters*).	08
Q:5	Submission of tour report and viva-voce	04
Q:6	Submission of certified journal	04
Total Marks		**40**

Practical-II (Paper-VII & VIII): Fundamentals of Biochemistry and Animal Physiology: Controlling and Coordinating Systems		
Questions		Marks
Q-1:	Qualitative tests of functional groups in carbohydrates, proteins and lipids. Or Estimation of protein and carbohydrates by colorimetric method.	08
Q-2:	Action of amylase or papain enzyme under optimum conditions **Or** Effect of pH, temperature and inhibitors on the action of amylase. **Or** Study of ABO blood group system and blood group antigens	08
Q:3:	Recording of simple muscle twitch demonstration. / Cardiogram (Virtual frog) **Or** Microtomy: Study of principle and mechanism of microtechnique: flow chart of technique, study of procedure and observation of Haemotoxylene Eosine staining technique using permanent slides.	08
Q:4	Spotting / Identification (any 4). **Mammalian T.S. or V.S. -** Tooth / Salivary gland / Stomach / IIeum / Liver / Pancreas / Kidney / Testis / Ovary	08
Q:5	Submission of tour report / Project/ review and viva-voce	04
Q:6	Submission of certified journal	04
Total Marks		**40**

SOLAPUR UNIVERSITY, SOLAPUR

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

For All Faculty

Syllabus of

Environmental Studies

For All UG Second year Semester IV

With effect from June - 2017

Structure for Environmental Studies

	Name and type of the paper		L/P	Credits	Total Marks	UA		CA	
	Type	Name							
Class	For All UG Semester IV (Second year)								
	Ability Enhancement Course (AECC)	Environmental Studies	50	4	100	70	28	30	12

1. The credit earned by student with this course shall not be considered for calculation of SGPA/CGPA
2. This course is not considered as a passing head for counting passing heads for ATKT
3. Student must pass this subject for award of the degree

Environment Studies (AECC)

[Credits: Theory-(4)]

Total Theory Lectures-(45)

Unit 1 : Introduction to environmental studies (2 lectures)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2 : Ecosystems (6 lectures)

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3 : Natural Resources : Renewable and Non-renewable Resources (8 lectures)

- Land resources and landuse change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4 : Biodiversity and Conservation (8 lectures)
- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5 : Environmental Pollution (8 lectures)
- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

Unit 6 : **Environmental Policies & Practices** (7 lectures)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 7 : **Human Communities and the Environment** (6 lectures)

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8 : **Field work** (Equal to 5 lectures)

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Carson, R. 2002. *Silent Spring.* Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India.* Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment,* London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis.* Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology.* Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36-37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology.* Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment.* Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment.* 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India.* Tripathi 1992.
14. Sengupta, R. 2003. *Ecology and economics:* An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics.* John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent.*
18. Warren, C. E. 1971. *Biology and Water Pollution Control.* WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth.* New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future.* Oxford University Press.

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	**Environment Studies**	**Environment Studies**

Nature of Question Paper :-

Time : - 2 ½ hrs.   Total Marks: - 70

Q. 1   Multiple choice questions (One Marks each)   14

1)
2)
3)
4)
5)
6)
7)
8)
9)
10)
11)
12)
13)
14)

Q. 2   Answer the followings. (Short Note/Short Problem/Short Answer)   14

a)   07

b)   07

Q. 3   Attempt the followings. (Short Note/Short Problem/Short Answer)   14

a)   07

b)   07

Q.4   Attempt **any one** of the followings. (Long Answer/Problem)   14
a)
   OR
b)

Q.5   Attempt **any one** of the followings. (Long Answer/Problem)   14

a)
   OR
b)

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

<center>**Paper –VIII Abstract Algebra**</center>

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]

    4.1 Concept of Polarization

    4.2 Double refraction and

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

    4.4 Nicol'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.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ZOOLOGY

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

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

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Background of Curriculum:

In accordance with the UGCs reference to standardize curricula at the national level and bring a match across all the Indian Universities, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template.

Zoology deals with the study of animal kingdom specially the structural diversity, biology, embryology, evolution, habits and distribution of animals, both living and extinct. As it covers a fascinating range of topics, the modern zoologists need to have insight into many disciplines. The learning outcomes-based curriculum framework for a B.Sc. degree in Zoology is designed to cater to the needs of students in view of the evolving nature of animal science as a subject. The framework is expected to assist in the maintenance of the standard of Zoology degrees/programmes across the country by reviewing and revising a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework, however, does not seek to bring about uniformity in syllabi for a programme of study in Zoology, or in teaching learning process and learning assessment procedures. Instead, the framework is intended to allow for flexibility and innovation in programme design and syllabi development, teaching learning process, assessment of student learning levels. A comprehensive knowledge of structure-function relationship at the level of gene, genome, cell, tissue, organ, and systems, through development would further add to the knowledge base and the learning outcome in terms of editing of genes and genomes for industrial application and research purposes.

Learning Outcomes based approach to Curriculum Planning:

The courses should be delivered in terms of concepts, mechanisms, biological designs & functions and evolutionary significance cutting across organisms at B.Sc. level. These courses should be studied by students of all branches of biology. Both chalk and board, and PowerPoint presentations can be used for teaching the course. The students should do the dissertation/ project work under practical of different courses, wherever possible.

The students are expected to learn the courses with excitements of biology along with the universal molecular mechanisms of biological designs and their functions. They should be able to appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how contributions from research and innovation have made the subjects modern, interdisciplinary and applied and laid the foundations of Zoology, Animal Sciences, Life Sciences, Molecular Biology and Biotechnology. These courses and their practical exercises will help the students to apply their knowledge in future course of their career development in higher education and research. In addition, they may get interested to look for engagements in industry and commercial activities employing Life Sciences, Molecular Biology and Biotechnology. They may also be interested in entrepreneurship and start some small business based on their interest and experience.

Graduate Attributes in Zoology:

- Disciplinary knowledge and skills: Capable of demonstrating (i) comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (ii) ability to use modern instrumentation for advanced genomic and proteomic technology.

- Skilled communicator: Ability to impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills.

- Critical thinker and problem solver: Ability to have critical thinking and efficient problem solving skills in the basic areas of Zoology

- Sense of inquiry: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

- Team player/worker: Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

- Skilled project manager: Capable of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

- Digitally literate: Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

- Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

- Lifelong learners: Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling

      Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level. The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

• Outline of Choice Based Credit System:

1. *Core Course:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. *Elective Course:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. *Ability Enhancement Courses (AEC):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• Credit: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

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 Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR	C-5		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
	C-6		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
	C-7 (Zoology)	**Paper-V: Cell Biology**		**3.0**	**--**	**--**	**50**	**40**	**10**	**4.0**
		Paper-VI: Principles of Ecology		**3.0**	**--**	**--**	**50**	**40**	**10**	
	SEC-1									
	GE-3									
Grand Total				18	--	--	300	240	60	12
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 will be Elective	C-8		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-9		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-10 (Zoology)	**Paper-VII Fundamentals of Biochemistry**		**3.0**	**--**	**--**	**50**	**40**	**10**	
		Paper-VIII Physiology-Control & Coordination		**3.0**	**--**	**--**	**50**	**40**	**10**	**4.0**

Subject									
	SEC-2								
	GE-4								
	Environmental Studies		3.0	--	--	50	40	10	NC
Total (Theory)			21	--	--	350	280	70	12
Practical	C-5 & C-8	Pr. III&IV	--	--	8	100	80	20	4.0
	C-6 & C-9	Pr. III&IV	--	--	8	100	80	20	4.0
	C-7 & C-10 (Zoology)	**Pr. I: (Cell Biology & Principles of Ecology) & Pr. II: (Fundamentals of Biochemistry & Physiology-Control & Coordination)**	**--**	**--**	**8**	**100**	**80**	**20**	**4.0**
	GE-3 & GE-4								
Total (Practical)					24	300	240	60	12
Grand Total			39		24	950	760	190	36

*Core Subjects

Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/
Microbiology/Geology/ Geography/Psychology

Core Subjects- (Additional)-Geochemistry/Biochemistry/Meteorology/Plant Protection

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practicals	Total – credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	300	12	24
Total		650	24	300	12	36

B.Sc. Programme :
Total Marks   : Theory + Practical's = 650 +300   =950
Credits   : Theory + Practical's = 12 + 24   = 36
Numbers of Papers   Theory: Ability Enhancement Course (AECC)   : 00
                                     Theory: Discipline Specific Elective Paper (DSE)   : 00
                                     Theory: CC   : 06
                        Skill Enhancement Courses   : 00
                        GE   : 00
Total   : Theory Papers   :

: Practical Papers   :

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

• 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.

• **Course outcome and Advantages:** Zoology has tremendous job potential. The successful students will be able to establish research organizations 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.

• Medium of Instruction: English
• Syllabus Structure:
• The University follows semester system.
• An academic year shall consist of two semesters.
• B.Sc. Part-II Zoology shall consist of two semesters: Semester III and Semester IV

In semester III: there will be two DSC papers having paper V and paper VI of 100 marks. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** Environmental Studies

In Semester IV: there will be two DSC papers having paper VII and paper VIII of 100 marks.

The scheme of evaluation of performance of candidates shall be based on **University Assessment (UA)** as well as **College Internal Assessment (CA)** as given below.

For B.Sc.Part-II Zoology Sem III & IV the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

• **Practical course examination** is of 100 marks shall be conducted at the end of semester II. The

practical examination of 100 marks shall also consist of **80 marks for University practical assessment** and **20 marks for college internal assessment (CA)**.

• **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 20 marks and external evaluation (University assessment) of 80 marks.

Semester – III: Theory: (100 marks): Comprising DSC-

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper V and paper VI of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper V and paper VI of 10 marks each)

c) **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** Environmental Studies

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

Semester – IV: Theory: (100 marks): Comprising DSC-

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper VII and paper VIII of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper VII and paper VIII of 10 marks each)

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
Practical Examination: (100 marks)
University Examination (80 marks): No. of practicals': 02

Practical-I: Based on papers V & VI :   (40 UA + 10 CA)
Practical-II: Based on papers VII & VIII   :   (40 UA + 10 CA)

Internal Continuous Assessment: (20 marks): Practical-I (10) + Practical-II (10)

(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 80 marks (Practical I & II for two separate days) will be conducted at the end of semester IV

Passing Standard:

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade.

Such student will have to reappear 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 reappear 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 of external examination and his performance shall be scaled to 100 marks.

• **ATKT:**

Candidate passed in all papers, except 5 (five) papers combined together of semester I and II of B.Sc. Part-I Zoology examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Zoology

B.Sc .II Semester-III & IV, ZOOLOGY
Choice Based Credit System (CBCS) Structure (2020-21)
Semester- III (Theory)

Paper	Title	Marks
V	Cell Biology	50 (40- UA and 10-CA)
VI	Principles of Ecology	50 (40- UA and 10-CA)

Semester- IV (Theory)

Paper	Title	Marks
VII	Fundamentals of Biochemistry	50 (40- UA and 10-CA)
VIII	Physiology-Control & Coordination	50 (40- UA and 10-CA)

PRACTICALS

PRACTICAL	Title	Marks
I	Cell Biology & Principles of Ecology	50 (40- UA and 10-CA)
II	Fundamentals of Biochemistry & Physiology Control & Coordination	50 (40- UA and 10-CA)
	Total Marks	100 (80-UA + 20-CA)

Paper-V

CELL BIOLOGY: THEORY (Credits-02 & contact hours-30)

Unit 1:   **Overview of Cells**   **02**
Prokaryotic and Eukaryotic cells, Virus, Viroids

Unit 2:   **Plasma Membrane**   **03**
Singer & Nicholson's model of plasma membrane. Transport across membranes:
An overview of active and passive transport

Unit 3:   **Endomembrane System**   **06**
Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes

Unit 4:   **Mitochondria**   **04**
Mitochondria: Ultrastructure, Semi-autonomous nature, Endosymbiotic hypothesis
Mitochondrial Respiratory Chain, functions.

Unit 5:   **Cytoskeleton**   **04**
Structure and Functions: Microtubules, Microfilaments

Unit 6:   **Nucleus**   **05**
Structure and functions of Nucleus, Nuclear envelope, Nuclear pore complex,
Nucleolus, Chromatin: Euchromatin, Hetrochromatin and nucleosome

Unit 7:   **Cell Division**   **04**
Cell cycle, Mitosis and Meiosis

Unit 8:   **Cell Signaling**   **02**
   •   Types of cell signaling , Brief idea of G-Protein Coupled Receptor (GPCR) and
Role of secondary   messengers (cAMP)

SUGGESTED READINGS

1) Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John
Wiley and Sons. Inc.
2) De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition.
Lippincott Williams and Wilkins, Philadelphia.
3) Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM
Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
4) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell.
VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
5) Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008).

Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

Learning outcomes : Students will come to know about:

- Cellular architecture & their functions at organismic level
- This knowledge will help students in future to explore areas like: oncology, medical diagnostics and treatment
- Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
- Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
- Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
- Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.

Paper-VI

PRINCIPLES OF ECOLOGY: THEORY (Credits-02 & contact hours-30)

Unit 1:   **Introduction to Ecology**   **02**
History of ecology, Autecology and synecology

Unit 2:   **Population Ecology**   **05**

Brief idea about attributes of population: Density, natality, mortality, life tables, fecundity tables, survivorship curves.

Unit 3:   **Animal Associations-** Brief idea and definitions   **05**
- Intraspecifc associations: Parental care in fishes, groupism and social behavior
- Interspecific associations: commensalism, mutualism, predation and parasitism

Unit 4:   **Abiotic Factors**   **03**

Introduction & Effects on animals: Temperature, light, water, water hardness, humidity, soil, oxygen and carbon dioxide.

Unit 5:   **Community**   **04**

Community characteristics: species richness, dominance, diversity indices, abundance.

Unit 6:   **Ecosystem**   **05**

General characteristics & faunal adaptations in:

- Aquatic (freshwater ecosystem: lotic and lentic) &
- Terrestrial (grassland and desert ecosystem).

Unit 7:   **Food chain:**   **04**

Pond ecosystem: with reference to food chain, ecological pyramid, energy flow and ecological succession

Unit 8   **Applied Ecology**   **02**

Brief idea of: Biodiversity hot-spots and sacred groves in India with examples

SUGGESTED READINGS:

1) Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2) Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3) Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4) Robert Leo Smith Ecology and field biology Harper and Row publisher
5) Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

Learning Outcomes (LO): Students will come to know about

- Ecological principles & applications that govern the planet Earth
- This knowledge will help students in future to explore areas like: biodiversity, conservation biology, forestry & natural resource management
- Know the evolutionary and functional basis of animal ecology.
- Understand what makes the scientific study of animal ecology a crucial and exciting endeavor.
- Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
- Analyze a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.

Semester-IV

PAPER-VII: FUNDAMENTALS OF BIOCHEMISTRY

THEORY (CREDITS 2; Contact Hours-30)

Unit 1: **Carbohydrates**   **(04)**
Structure and biological Significance of: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates

Unit 2: **Lipids**   **(04)**
Structure and biological Significance of: Physiologically important of saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids

Unit 3: **Amino Acids**   **(03)**
Amino acids: Structure, Classification and General Properties of α-amino acids;

Unit 4: **Proteins:**
Levels of organization in proteins (primary, secondary, tertiary & quaternary); Simple and conjugate proteins with examples   **(02)**

Unit- 5: **Immunoglobulins:**
Basic Structure, Classes and biological significance   **(02)**

Unit 6: **Nucleic Acids**   **(04)**
Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids: Base pairing, Denaturation and Renaturation of DNA; Types of DNA and RNA.

Unit 7: **Central Dogma**
Basic concepts of replication, transcription and translation in prokaryotes   **(04)**

Unit 8: **Enzymes**   **(07)**
Nomenclature and classification; Co-factors; Properties of enzymes; Mechanism of enzyme action; Factors affecting enzyme actions; Enzyme inhibition, Isozymes

Learning Outcome:

After successfully completing this course, the students will be able to:

- Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.

- Understand the structure and function of immunoglobulins.

- Understand the concept of enzyme, its mechanism of action and regulation.

- Understand the process of DNA replication, transcription and translation.

- Learn the preparation of models of peptides and nucleotides.

- Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.

- Learn measurement of enzyme activity and its kinetics.

PAPER-VIII
ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

THEORY (CREDITS 2; Contact Hours-30)

Unit 1: **Tissues** **(04)**
Structure, location, classification and functions of: epithelial tissue, connective tissue, muscular tissue and nervous tissue :
Blood –Types of blood cells(RBC,WBC ,Platelets , Plasma) , functions of blood

Unit 2: **Histology of following mammalian organs:** **(04)**
i) Tooth   ii) Salivary gland   iii) Stomach   iv) IIeum
v) Liver   vi) Pancreas vii) Kidney viii) Testis   ix) Ovary

Unit 3: **Nervous System** **(04)**
Ultastructure of neuron, resting membrane potential, origin of action potential and its propagation across the nerve fibers; Structure of Synapse and Synaptic transmission,

Unit 4: **Muscle** **(03)**
Types of muscles (smooth, Striated, cardiac) and Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction.

Unit 5: **Reproductive Physiology** **(03)**
Pituitary gland & its hormones, Sex hormones (male & female)

Unit 6: **Reproductive Cycle** **(04)**
Oestrous and Menstrual cycle, Hormonal control of pregnancy, parturition and lactation; Contraception methods: Physical, oral contraceptives pills, IUD, surgical methods

Unit 7: **In-vitro Fertilization** **(02)**
Technique of IVF and its applications

Unit 8: **Endocrine System** **(06)**
Histology, hormonal secretions & their functions and disorders of following endocrine glands- Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal.

*Note: With reference to mammals.

Learning outcomes:

After successfully completing this course, the students will be able to:

- Acquire knowledge of the coordinated physiological functioning

- Realize that very physiological mechanisms are used in very diverse organisms.

- Understand how cells, tissues, and organisms function at different levels.

- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc
- Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
- Undertake research in any aspect of animal physiology in future.

REFERENCES:

CELL BIOLOGY:

- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

ECOLOGY:

- Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

FUNDAMENTALS OF BIOCHEMISTRY:

- Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.
- Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Pub.

PHYSIOLOGY: CONTROL & COORDINATION:

- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII

19

Edition. Lippincott W. & Wilkins.

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Practical-I (Paper-V & VI): Cell Biology and Principles of Ecology (04 Credits)

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.

2. Study of various stages of meiosis in onion flower buds.

3. Demonstration/ Observation of Barr body using permanent slide(s) *(spotter)*

4. Study of principle and procedure and technique using permanent slide *(spotter)*
i) DNA by Feulgen technique.
ii) Mucopolysaccharides by Periodic Acid Schiffs Reaction (PAS)

5. Study and construction of ecological pyramid from given data:
i) Members of Grass land ecosystem –
Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard.
ii) Members of Pond ecosystem –
Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra.

6. Calculation of Shannon-Weiner diversity index from the given data/ model.

7. Study of an aquatic ecosystem: Identification of Zooplankton with the help of permanent slides (*Spotters*),
 8. Estimation of Dissolved Oxygen (Winkler's method) from given sample,
 9. Estimation of Carbondioxide (CO_2) from given sample.
 10 .Estimation of Total Hardness content from given sample.

 11 Study Visit: Report on a visit to National / Central / State institutes / Local water bodies/National Park/Biodiversity Park/Wild life sanctuary.

Practical-II
(Paper-VII & VIII):

FUNDAMENTALS OF BIOCHEMISTRY and ANIMAL PHYSIOLOGY: CONTROLLING
AND COORDINATING SYSTEMS (CREDITS-04) **

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.

2. Estimation of protein by colorimetric method.

3. Estimation of carbohydrates by colorimetric method.

4. Demonstration of paper chromatography of amino acids.

5. Action of amylase or papain enzyme under optimum conditions.

6. Effect of pH, temperature and inhibitors on the action of amylase.

7. Demonstration of proteins separation by SDS-PAGE.

8. Recording of simple muscle twitch/ Cardiogram – demonstration.   (Virtual frog/ computer
generated)
(Analysis of given graph of Frog- muscle twitch or cardiogram In the examination
students are provided with any one computer generated graph and supposed to
'Analyze the given graph and explain details of principle, procedure, result,
Inference and viva-voce based on the given practical is expected)

 9. Study of permanent slides (T.S./V,S.) - of Mammalian organs using permanent slides:
 i) Tooth   ii) Salivary gland   iii) Stomach   iv) IIeum v) Liver   vi) Pancreas vii) Kidney
viii) Testis   ix) Ovary

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

11. Microtomy: Study of principle , procedure and mechanism of micro-technique and microtome :
flow chart of technique, study of procedure and observation of HE staining technique/ whole mount
using permanent slides (study of protocol using flowchart).

12. Study visit: Visit to wetlands, medical college, pathology laboratory and blood bank

OR

13. Preparation and submission of small project/ review on topics related to ecology, cell biology,
biochemistry and physiology

**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. For laboratory observations existing permanent slides and specimens should be shown. As per the guidelines of UGC , all the Zoology departments should be empowered with infrastructure to adopt Information communication technology (ICT) required for the purpose of virtual dissections for which virtual class room / laboratory to be enriched with few computers (according to the strength of students),internet facility , printer etc.

Skeleton paper for practical examination
(University Examination for 40 Marks)

<table>
<tr><td colspan="3" align="center">Practical-I (Paper-V & VI)
Cell Biology and Principles of Ecology</td></tr>
<tr><td colspan="2" align="center">Questions</td><td align="center">Marks</td></tr>
<tr><td>Q-1:</td><td>Preparation of temporary stained squash of onion root tip to study various stages of mitosis <i>OR</i> Study of various stages of meiosis in onion flower buds.</td><td>08</td></tr>
<tr><td>Q-2:</td><td>Estimation from given sample - of Dissolved Oxygen (Winkler's method) <u>OR</u> Carbondioxide (CO_2) <i>OR</i> Total Hardness content</td><td>08</td></tr>
<tr><td>Q:3:</td><td>Study and construction of ecological pyramid from given data:

<i>i) Members of Grass land ecosystem –</i>

Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard.

OR

<i>ii) Members of Pond ecosystem –</i>

Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra.</td><td>08</td></tr>
<tr><td>Q:4</td><td>Spotting / Identification (Any four)
Zooplankton with the help of permanent slides (chart/ model /photo) / Bar body (<i>Spotters</i>).</td><td>08</td></tr>
<tr><td>Q:5</td><td>Submission of tour report and viva-voce</td><td>04</td></tr>
<tr><td>Q:6</td><td>Submission of certified journal</td><td>04</td></tr>
<tr><td colspan="2" align="center">Total Marks</td><td>40</td></tr>
</table>

Practical-II (Paper-VII & VIII): Fundamentals of Biochemistry and Animal Physiology: Controlling and Coordinating Systems		
Questions		Marks
Q-1:	Qualitative tests of functional groups in carbohydrates, proteins and lipids. Or Estimation of protein and carbohydrates by colorimetric method.	08
Q-2:	Action of amylase or papain enzyme under optimum conditions **Or** Effect of pH, temperature and inhibitors on the action of amylase. **Or** Study of ABO blood group system and blood group antigens	08
Q:3:	Recording of simple muscle twitch demonstration. / Cardiogram (Virtual frog) **Or** Microtomy: Study of principle and mechanism of microtechnique: flow chart of technique, study of procedure and observation of Haemotoxylene Eosine staining technique using permanent slides.	08
Q:4	Spotting / Identification (any 4). **Mammalian T.S. or V.S. -** Tooth / Salivary gland / Stomach / IIeum / Liver / Pancreas / Kidney / Testis / Ovary	08
Q:5	Submission of tour report / Project/ review and viva-voce	04
Q:6	Submission of certified journal	04
Total Marks		**40**