Solapur University, Solapur

Faculty of Science

B.Sc.Part- II

General Structure as per

Credit and Grading System

(June, 2015)

Solapur University, Solapur

Faculty of Science

Credit and Grading System

(W.e.f. June, 2015)

- **Title of the Course:** B.Sc.- Part II
- **Subject :** ____Botany_____
- **The Credit and Grading System :**
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With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing under graduate degree,Solapur University has implemented Credit and grading system of Evaluation at Undergraduate level.

Credit is a numerical value that indicates student's work load (Lectures, Lab work, Seminars, 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. As per present norms, there are 4 contact hours per paper (subject) per week which works out to be 60 contact hours per paper (subject) per semester.

In Solapur University, for B. Sc.-II, there are 3 optional subjects and Environmental Studies. For B. Sc.-II, there are 6 contact hours per paper (subject) per week for each optional subject. Therefore, total contact hours per week are 18. Each subject has 90 contact hours, which are transformed into 6credits. As there are 4 contact hours per week forEnvironmental Studies, 4 credits shall be assigned forEnvironmental Studies.

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 30 marks and University Evaluation for 70 marks. It is 70 + 30 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

- **Conversion of marks into Grades :**

A table for the conversion of the marks obtained by a student in each paper (out of 100) to grade and grade points is given below.

Sr. No	Range of Marks	Grade	Grade Point
1.	80-100	O	10
2.	70-79	A+	9
3.	60-69	A	8
4.	55-59	B+	7
5.	50-54	B	6
6.	45-49	C+	5
7.	40-44	C	4
8.	<39	FC	0 (Failed in Term Exam)
9.	<39	FR	0 (Failed in Internal Assesment)

1. **Grade Point Average at the end of the Semester (SGPA)**

$$(G_1 x C_1) + (G_2 x C_2) + \ldots\ldots$$

$$SGPA = \frac{\text{-------------------------------}}{\Sigma C_i}$$

(ΣC_i- The total number of credits offered by the student during a semester)

2. Cumulative Grade Point Average (CGPA)

$$CGPA = \frac{(G_1 x C_1) + (G_2 x C_2) + \ldots\ldots}{\Sigma C_i}$$

ΣC_i - the total number of credits offered by the student upto and including the semester for which CGPA is calculated.)

3. Final Grade Point Average (FGPA) will be calculated in the similar manner for the total number of credits offered for completion of the said course.

Where: C_i: Credits allocated for the ith course

G_i: Grade point scored in ithpaper (Subject)

4. Conversion of average grade points into grades:

SGPA/CGPA/FGPA	Letter Grade
9.5 - 10	O
8.5 -9.49	A+
7.5 – 8. 49	A
6.5 – 7.49	B+
5.5 – 6. 49	B
4.5 – 5. 49	C+
4.0 – 4. 49	C
< 3.99	FC /F
	FR

Solapur University, Solapur
Faculty of Science
Credit System Structure for B.Sc.II Semester III

Class	Sem	Subject	No. of Papers/ practicals	Hrs/Week			Paper Marks	UA	CA	Credits	Total credits
				L	T	P					
B.Sc.II	III										
		Subject 1	Paper III	3	-	-	100	70	30	3	
			Paper IV	3			100	70	30	3	6
		Subject 2	Paper III	3	-	-	100	70	30	3	
			Paper IV	3			100	70	30	3	6
		Subject 3	Paper III	3	-	-	100	70	30	3	
			Paper IV	3			100	70	30	3	6
Total				18			600			18	18
Grand Total				**18**			**600**			**18**	**18**

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination

UA (University Assessment): University Theory paper shall be of 70 marks for 3.0hrs duration

CA (College Assessment): The internal examination for Theory and Practical course.

Solapur University, Solapur
Faculty of Science
Credit SystemStructureforB.Sc.II Semester IV

Class	Sem	Subject	No. of Papers/ practicals	Hrs/Week			Paper Marks			Practical			Credits
				L	T	P		UA	CA	Marks	UA	CA	
B.Sc. II	IV	Environmental Studies	(compulsory)	4	-	-	100	70	30				4
		Subject 1	Paper V	3	-	-	100	70	30				3
			PaperVI	3			100	70	30				3
		Subject 2	Paper V	3	-	-	100	70	30				3
			PaperVI	3			100	70	30				3
		Subject 3	Paper V	3	-	-	100	70	30				3
			PaperVI	3			100	70	30				3
Total Theory				**22**			**700**						**22**
		Practical 1		-	-	8				200	140	60	4
		Practical 2		-	-	8				200	140	60	4
		Practical 3		-	-	8				200	140	60	4
TotalPract.						**24**				**600**			**12**
Grand Total										**1300**			**34 18**
B.Sc. Part II										**1900**			**52**

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination

UA (University Assessment): University Theory paper shall be of 70 marks for 3.0hrs duration

CA (College Assessment): The internal examination for theory and Practical course.

General Guidelines for Credit and Grading System
B.Sc.II

1. The University follows Semester system
2. An academic year shall consist of two semesters
3. Each B.Sc. course shall consist of three years i.e. six semesters
4. Environmental Studies paper shall remain compulsory for B.Sc.Part- II students inIV[th] Sem.
4. B.Sc.Part-II shall consist of two semesters: Semester III and Semester IV.

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

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below.ForB.Sc.PartII SemIII&IV the internal assessment will be based on Unit tests, Home assignment,viva,practicals, Project Worketc as givenbelow.Practical course examination of 200 marks for each subject shall be conducted at the end of IV[th]semester. The practical examination of 200 marks shall also consist of 140 marks for University practical assessment and 60 marks for college internal assessment.

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

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

5. **Scheme of evaluation:**

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

Semester -III:
Theory : (100 marks)
University Examination (70 Marks): No. of Theory papers: 2 Papers/Subject (Total 6 Papers)
Internal Continuous Assessment (30 Marks):
Scheme of Marking: 20 Marks: Internal Test
 10 Marks: Home assignment/Tutorials/Seminars/ Group discussion/ Viva/Field visit/Industry visit.
Semester -IV:(100 marks)
Theory:
University Examination (70 Marks): No of Theory papers: 2 Papers/Subject (Total 6+1Papers)
Internal Continuous Assessment (30 Marks):
Scheme of Marking: 20 Marks: Internal Test
10 Marks: Home assignment/Tutorials/ Seminars/ Group discussion/ Viva/ Field visit/Industry visit.
Practical Examination:
University Examination (140 Marks): No of Practicals: 1 Practical /Subject (Total 3Practicals)
Internal Continuous Assessment (60 Marks):

Scheme of Marking: 40 Marks: Internal Test on any fourpracticals, 20 Marks: Lab Journal/viva, attendance, attitudeetc.

For Environmental Studies there shall be theory examination of 70 marks (UA) and 30 marks (CA) internal assessment. The internal assessment for environmental studies shall be based on internal test/ home assignment/tutorial of 10 marks and project work and report of 20 marks.

6.**Passing Standard**

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

- **ATKT**

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

SOLAPURUNIVERSITY, SOLAPUR

B.Sc. Part – II (Botany)

w.e.f.- JUNE, 2015

Semester – III

Paper – III: Structural Botany & Taxonomy of Angiosperms (45 Periods)

Unit- 1:Meristems: 07

   1.1   Introduction and Classification of meristems

   1.2-   Functions of meristems

   1.3   Theories of structural development –

   a) The Apical cell theory

   b) Histogen Theory

   c) Tunica corpus theory

Unit-2: Permanent tissues   07

   2.1   Structure and functions of simple   tissues.

   2.2   Structure and functions of Complex tissues-

   2.3   Types of vascular bundles

Unit-3:Tissuesystems and their functions: 07

   3.1   Epidermal Tissue System

   3.2   Secretory Tissue System

   3.3   Mechanical Tissue System

Unit-4: Primary structure of plant organs   06

    4.1   Primary structure of monocot root and stem- (Maize)

    4.2   Primary Structure of dicot root and stem-(Sunflower)

Unit-5: Secondary body of the plant   10

    5.1   Normal Secondary growth in Dicot root and stem.

    5.2   Periderm, Lenticels and Annual rings.

    5.3   Basic structure of wood and its types.-

    5.4   Anomalous secondary growth in *Bignonia* and *Dracaena*stem

Unit-6: Taxonomy of Angiosperms   08

Study of Angiosperm families with respect to classification,morphology of vegetative and reproductive parts, floral formula, floral diagram, diagnostic features and economic importance.

   a) Combretaceae   b) Asclepiadaceaec) Amaranthaceaed) Liliaceae.

References Book:-

Paper:III Structural Botany and Taxonomy of Angiosperms

1. P.C.Vashista. Plant Anatomy.Pradip Publications, Opposite Sitlamandir, Jalandhar- 144008.

2. B.P.Pandey ,Plant Anatomy. S.Chand&Company,LTD. Ram Nagar, New Delhi.110055.

3. A.C.Datta. Botany For Deree students. Press-Delhi, Bombay, Madrass.S

4. Carlquist, S. 1998. Comparative Wood Anatomy: Systematic, Ecological and Evolutionary Aspects of dicotyledonous Wood. Springer – Verlag, Berlin.

5. Culter, E.G. 1969. PartI. Cells and Tissues. Edward Arnold, London.

6. Culter, E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part II Organs. 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 of Plants. 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. CambridgeUniversity, Press, Cambridge.

15. Thomas, P. 2000. Trees: Their Natural History. CambridgeUniversity Press, Cambridge

16. Morphology of Angiosperms, J M Coulter and C J Chamberlain, Pointer Publishers, Jaipur.

17. Taxonomy of Angiosperm R Pandey, S Chand and Co. Ltd, Ramnagar New Delhi.110055

18. An Introduction to Taxonomy of Angiosperms-PritishShukla, Shital P Mishra, Vikas Publishing House, Pvt.Ltd.Gaziabad, UP.

19. A Text Book of Angiosperms-B P Pandey, S Chand and Co Ltd.ramnagar, New Delhi.110055

20. A Text Book of Botany -'Angiosperm,'V Singh C Pande, D K Jain, Rastogi Publication, Shivaji Road Meerut.250002

21. Taxonomy of Angiosperm, NeeruMathur, Sonali Publications, New Delhi, 110002.

22. Angiosperms-G L Chopra, Pradeep Publications, Jalandhar, 144008.

Paper-IV: PLANT ECOLOGY

(45 Periods)

Unit-1: Introduction   06

    1.1)Climatic factors**.**

    1.2)Edaphic factors

Unit-2:Community Ecology-   08

    2.1) Form and structure of communities

    2.2) Classification and Physiognomy.

    2.3) Community characteristics

Unit-3: Ecosystem   11

    3.1)   Concept and types

    3.2)   Components and Organization of ecosystem

    3.3)   Ecological pyramids, Food chains and food webs.

    3.4)   Energy flow in ecosystem.

    3.5)   Biogeochemical cycles – Nitrogen, Oxygen, Carbon,

Unit-4: Ecological Succession   06

    4.1)   Concept and process

    4.2)   Primary and Secondary succession

    4.3)   Hydrosere and xerosere

Unit-5:Ecological adaptations   **08**

    5.1)   Introduction

    5.2)   Xeric, Hydric and Mesic adaptations

Unit-6:Pollution: **06**

    6.1) Introduction

    6.2) Air pollution-Definition,Sources of air pollutants, their effects and control

      measures.

    6.3) Water pollution-Definition,Sources of water pollutants, their effects and

      Controlmeasures.

References Book:-

Paper-IV-<u>Plant Ecology</u>

1. Odum, E.P. Ecology. Oxford&F.B.h.PublishingCo.pvt.LTD-New Delhi..

2. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin / Cummings Publication Co., California.

3. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi.

4. Hill, M.K. 1997. Understanding Environmental Pollution. CambridgeUniversity Press.

5. Mackenzie, A. et al. 1999. Instant Notes in Ecology. Viva Books Pvt. Ltd., New Delhi.

6. Ashok Bendre / Ashok Kumar Economic Botany RastogiPublications Shivaji Road, Meerut – 250002 India.

7. Prof. M.A. Khan – Environment, Biodiversity and Couservation S-B Nangia, A.P.H. Publishing Corporation, 5, Ansari Road, Daryaganj New Delhi – 110002.

8. B.P. Pandey – Modern Practical Botany Vol – I / II Chand & Company Ltd. Ramnagar New Delhi – 110055.

9. B.P. Pandey – Economic Botany Vol – I / II Chand & Company Ltd. Ramnagar New Delhi – 110055.

10. Pavas Divan – Environ Protection – Deep & Deep Publications D-I 124, RajouriGarden, New Delhi – 110027.

11. P.S. Verma / V.K. Agrawal – Concept of Ecology, S. Chand &Lonpan Ltd. Ramnagar, New Delhi – 110055.

12. Eug Warming – Ecology of Plants, Ambey Publications Delhi (India)

13. Evgene P Odum – Ecology Oxford & IBH Publishing Co. Pvt. Ltd. Culcutta, New Delhi.

14. IshwarPrakash. Desert Ecology. Scientific Publications, Ratandas Road,Jodhpur.-342001-India.

15. T.W. Woodhead. Plant Ecology. SonaliPublications.New Delhi.110002.

16. Eug. Warming. Ecology of Plant. Ambey Publications Delhi.

17. Jonathan Silvertown. Introduction To Population Plant Ecology. Longman Singapure .Publisher, LTD.

18. R.S. Shukla& P.S. Chandel. Plant Ecology. S.Chand& Company LTD. Ram Nagar, New Delhi.110055.

SEMESTER- IV

Paper –V: Plant Physiology and Cytogenetics

(45 periods)

Unit-1: Photosynthesis: **12**

1.1 Introduction and significance

1.2 Photosynthetic apparatus

1.3 Photosynthetic pigments, accessory pigments,Photosystems – reaction

center complexes

1.4 Light reaction – cyclic and non-cyclic

1.5 Dark reactions - Calvin cycle, C4 cycle, CAM (NADP – ME type)

Unit-2: Transport of organic substances (Phloem Transport) **06**

2.1 Definition and types of transport (Symplastic and apoplastic)

2.2 Phloem loading and unloading

2.3 Mechanism of translocation in phloem -Mass flow hypothesis,

Unit-3: Nitrogen metabolism **08**

3.1 Introduction

3.2 Nitrogen cycle

3.3 Biological N_2 fixation – Definition, types & organisms involved

3.4 Mechanism of Biological Nitrogen fixation (Symbiotic and non symbiotic)

3.5 Significance of Biological Nitrogen fixation.

Unit-4:Physical basis of inheritance: - **07**

4.1) Chromosome- Definition, types of chromosomes.

4.2)Study of Meiotic cell division and its significance.

Unit-5: **Classical genetics**   **12**

5.1) Linkage-Definition, Kinds ofLinkage-complete, incomplete and linkage

groups, Significance of linkage.

5.2)Crossing over-Definition, Mechanism of crossing over, 'Break and exchange'

theory, (Stern and Hotta, 1969), Signifcance of crossing over.

References Book:-

Paper-V-Plant Physiology and Cytogenetics

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.

4. Taiz, L. and Zeiger, E. 1998. Plant Physiology (2nd edition) Sinauer Associates, Inc., Publishers, Massachusetts, USA.

5. R.C. Grewal – Plant Physiology Campus Brokes 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.

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11. V.I. Paladin. Plant Physiology. Arihant Publishers. Jaypur, (India)

12. Dr. S. Sundararajan. 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, Maryland-21202,U.S.A.

14. P.S Verma,V.KAgarwal,CellBiology,Genetics,Evolution and Ecology,S.Chand and Co.Pvt.Ltd.,Ramnagar,New Delhi,110055

15. W.R.Singleton, Elements of Genetics, VanNostrand, ReinholdCo.melborne, AffiliatedeastwestPress, pvt.ltd. newdelhi.

16. A.M Winchester,Genetics,Oxford and IBH,PublishingCo.New Delhi-110055.

17. P.S Verma, V K Agarwal;Genetics,S Chand and Co.Ramnagar,New Delhi-110055

18. Dr (Mrs.) Veer BalaRastogi,A text Book of Genetics,KedarnathRamnath road,Meerut-250001.

19. H.S Bhamrah,KavitaJuneja,Genetics and Evolution,AnmolPublication,Pvt.ltd.New delhi-110002.

Paper-VI: Utilization of Plant

Unit-1: Botanical names, Morphology, Source and Economic importance of the

followings   **10**

1.1) Legumes-Pulse crops-Chickpeaand Red gram, Fodder legumes - Lucerne

and   *Sesbania*

1.2) Plant Fibers-Cotton and Coir

Unit-2: Vegetable oil sources   05

2.1.   Botanical name, source and economic importance of – Groundnut,

Soybean.

2.2   Brief account of cultural practices of Ground nut and Soybean.

Unit -3:- Medicinal plants   10

A brief account of plant drugs and their chief constituents used in Indigenous and allopathic systems in –

A) Rhizome – *Zingiberofficinale*

B) Root –*Withaniasomnifera*

C) Stem – *Tinosporacordifolia*

D) *Leaf –Adhatodazeylanica.*

E) Floral bud – *Syzigiumaromaticum*

F) Fruit – *Emblicaofficinalis*

Unit-4:- Natural Products   **12**

4.1)**Rubber** – Introduction, properties of rubber, source (*Heveabrasilensis*), morphologicl characters ,extraction method and economic importance

4.2)**Botanical pesticides-**

Introduction- Botanical name, morphological characters, source and importance ofNeem, Tobacco, Custard apple.

4.3) PlantDyes - Botanical name, sourceand economic importance.

a) Wood-Log wood,Kutch.

b) Bark-Oak,Teak.

c) Root and rhizome -Manjista,Turmeric,

d) Leaves- Indigo, Henna.

e) Flowers-Saffron,Palas.

Unit 5:Ornamental Plants:-Botanical name and ornamental value of following plants. **04**

5.1)   Seasonals - ***Celosia, Chrysanthemum sp.***

5.2)   Perennials – ***Acalypha,Crossandra, sp.***

5.3)Cacti and succulents – ***Opuntia and Bryophyllum***

5.4) Climbers – ***Bougainvillea, Quisqualis sp.***

Unit 6: Plants perfumes and cosmetics   **04**

6.1. Introduction, Botanical name, source and economic importance of Citronella,

Jasmine, Rose, Aloe

References Book:-

Paper-VI: Utilization of Plant

1. R.C. Grewal – Medicinal plants, Campus Books International 4831/24, Prahiad street, Ansari Road, Darya Ganj, New Delhi – 110002. Fax : 91-011-3257835.

2. F.O. Bower – Plants and Man Ariana Publishing House, New Delhi – 110012.

3. Fuller, K.W. and Galon, J.r. 1985. Plant Products and New Technology. Calrendon Press, Oxford, New York.

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8. B.P.Pandey Economic Botany. S.Chand& Company pvt. LTD. Ram Nagar New Delhi. 110055.

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11. He nery Kraemer Applied Economic Botany Ambey Publications, New Delhi.

12. A Textbook of economic Botany (EDN 1989)

By SAMBA MURTY & N S Subramanyam. Publ.WileyEsternLTD.New Delhi .

13. A Text book of Medicinal plants .Prajkta, Purohit, Sharma, Kumar (2007)

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Solapur University, Solapur

PRACTICALS IN BOTANY AT B.Sc. Part – II

(w.e.f.- June 2015)

Botanical excursions – One teacher along with a batch not more than sixteen students be taken for Botanical excursions to places of botanical interest, one in each term. If there are female students in a batch of sixteen, one additional lady teacher is permissible for excursion. Each excursion will not be more than 5 days during college working days. T.A. and D.A. for teachers and non teaching staff participating in the excursions should be paid as per the rules. The tour report duly certified by the concerned teacher and the head of the department should be submitted at the time of practical examination.

Practical – I and II are to be covered in 25 practicals each. These practicals are to be performed by the students. Each practical is to be supplemented by permanent slides, preserved / fresh specimens / materials, charts, herbarium sheets, wherever necessary.

Every candidate must produce a certificate from Head of the Department in his / her college stating that he / she has completed practical course in a satisfactory manner as per the lines laid down by academic council on the recommendations of Board of Studies in Botany. The student should record his / her observations and report of each experiment should be written in the Journal.

The Journal is to be signed periodically by teacher in charge and certified by Head of the Department at the end of the year. Candidates have to produce their certified journal and tour reports at the time of practical examination. A candidate will not be allowed to appear for the practical examination without a certified journal, otherwise a candidate must produce a separate certificate of his / her regular attendance for practical course and completion of the same signed by the concerned teacher and Head of the Department.

Distribution of Marks:

Practical – I --- **70 Marks**

Sr. No.   **Particulars**

1)   Structural Botany and Taxonomy of Angiosperms.   25Marks

2.)   Plant Ecology   25Marks

3.)   Journal   10 Marks

4.)   Tour report   10 Marks

Practical – II --- **70 Marks**

1)   Plant Physiology and Cytogenetics   25 Marks

2.)   Utilization of Plant   25 Marks

3.)   Journal   10Marks

4.)   Horticultural Term Paper   10Marks

Each practical examination (Practical I and II) should be of maximum. 5 hours duration and shall test a candidate in respect of following –

   i.   Identification and preparation of temporary and permanent slides.
   ii.   Practical study of external and internal structures of different plants as per the syllabus.
   iii.   Identification of the angiosperm specimen and assigning to its family with FF and FD
   iv.   Understanding of principles of the experiments.
   v.   Identification and setting of ecological experiments.
   vi.   Identification and setting of Physiological experiments.

vii.   Solving problems based on linkage and crossing over

viii.   Recording of observations and conclusions.

ix.   Identification of the plant specimen ,mounting (reproductive structures) and classification

x.   Identification and understanding of the practicals conducted with respect to development of plants and their utilization.

xi.   Spotting of the specimens as per the syllabus.

x.   Submission of the tour report and Horticultural term paper.

B.Sc. Part – II (Botany)

Practicals (Laboratory Exercise)

Practical No. I (Based on Paper – III&IV)

1) Study of organization in.shoot tips of V S of- **Hydrilla /Bryophyllum** (w.m.).

2) Study oforganization in root tips of V.S –ofOnion / Aerial roots of **Ficus** (w.m)

3) Study of primary structure of root and stem of monocot plant using hand sections Or permanent slides (Maize)

4) Study of primary structure of root and stem of dicot plant using hand sections Or permanent slides (Sunflower)

5)Secondary growth in dicot stem and root.(Sunflower)

6)Anomalous secondary growth in **Bignonia** stem by using permanent double stained technique

7) Anomalous secondary growth in **Dracaena** stem by using Permanent double stained technique.

8)Maceration technique

9)Study of Epidermal tissue system.

10) Study of Mechanical tissue system.

11) Study of Secretory tissue system..

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

13-16) Study of Angiosperm families as per syllabus.

17) Study of the working and use of meteorological instruments.(Any three)

18) Study of soil pH and water holding capacity (any two soil samples)

19) Determination of density & frequency of different plant species by quadrat method.

20) To prepare a report on any ecosystem from nearby locality. (Supplimentary)

21) Ecological adaptations in morphology and anatomy of hydrophytes –

      1) Submerged-(*Hydrilla*) 2) Floating, (*Eicchornia*) 3) Amphibious (*Typha*)

22) Ecological adaptation of xerophytes (**Nerium**&**Aloe**).

23) Ecological adaptations of Epiphyte (orchid) and parasite (**Cuscuta**)

24) Detection of Sulphate, Chloride From polluted water sample(Demo.)

25) Tour report (To be written separately and submitted)

Practical No. II -(Based on Paper V & VI)

1) Separation of photosynthetic pigments by ascendingPaper chromatography.

2) To study the effect of CO_2 concentration on the rate of photosynthesis.

3) To study C_3 and C_4 plants by Kranz anatomy.

4)   Estimation of TAN.

5) Study of Osmosis.

6) To study the permeability of plasma membrane.

7)   Study of root nodules in any legume crop.

8) Study of meiosis (Smear preparation) using onion buds.

9-10) Problems on linkage and crossing over

11)   Study of Vegetative, Floral morphology and pod in Chickpea, Red gram.

12) Study of fodder legumes- Source and uses-   *Sesbania* and Lucern

13)   Study of structure of oil storing tissues in sectioned seeds of Groundnut,

   and Coconut endosperm using micro chemical tests.

14)   Study of vegetative, Floral and Fruit morphology of Cotton.

   Microscopic structure Cotton fiber,

15-18)   Study of plants (live or herbarium) used as resource of drugs as per theory.

19)   Study of plant pesticides(as per theory)

20)   Study of dyes -source and uses (as per theory)

21-22) Study of ornamental plants, seasons of flowering plants, botanical name

morphology and uses. (as per theory)

23) Study of plant perfumes and cosmetics (as per theory)

24-25)Horticultural term Paper-Based on – Seasonals/ perennials/

   Climbers/ cacti/ succulents/ bonsai/ indoor plants and cut flowers etc.

Solapur University, Solapur

B.Sc. Part – II Practical Examination, March / April 201--

BOTANY PRACTICAL – I

Centre: Total Marks: 70

Date: Time: 11.00 a.m. onwards

N.B.:   1. Draw near labeled sketches whenever necessary.

             2. Do not write about theoretical points, unless asked specifically.

             3. Record your observations carefully and neatly wherever asked.

Q. 1   Make a double stained permanent micro preparation of a T.S. of Specimen A and

show it to the examiner (No written answer)   08

Q. 2   Macerate the given material 'B' and prepare the slide from it. Show the slide to

the examiner (No written answer)   05

Q-3 Assign the specimen 'C' to its respective family on the basis of characters observed

by you in it. Give important vegetative and floral characters. Draw the floral diagram

/ write the floral formula of it   (Written answer).   08

Q. 4   Prepare the list quadrat of the marked area and find out the percentage

Frequency / Density of different species there in.   10

Q-5- Set up the ecological experiment 'D' assigned to you & show it to the examiner 09

<div align="center">**Or**</div>

Describe the ecological adaptation in the given specimen. 'D'

Q. 6   Identifications

    a) Identify and describe (Anatomy)   02

    b) Identify and describe (Anatomy)   02

    c) Identify and describe   (Ecology)   02

    d) Identify and comment – (Ecology)   02

    e) Identify and comment – (Ecology)   02

Q. 7   a) Journal   10

    b) Excursion report.   10

70

Solapur University, Solapur.

B.Sc. Part – II Practical Examination, March / April 201....

BOTANY PRACTICAL – II

Centre: **Total Marks: 70**

Date: **Time: 11.00 am onwards**

N.B. :   1. Draw near labeled sketches wherever necessary.

                 2. Do not write about theoretical points, unless asked specifically.

                 3. Record your observations carefully and neatly wherever asked.

Q. 1) Set up the physiological experiment assigned to you and record your observation, submit the report to the examiner (Written answer).   09

Q. 2) Arrangethe physiological experiment given to you and show it to the examiner.

    (No written answer).   06

Q-3) Solve the genetic problem based on linkage and crossing over.(Written answer). 08

Q-4) Identify, give the botanical name,source and economic importance of Specimen 'A'

(Written answer).   09

Q. 5)Identify, give the botanical name, and uses of Specimen 'B' & 'C'.(written answer). 08

Q. 5) Identifications:

      a) Identify and comment – (Cytogenetics)   02

      b) Identify and comment – (Plant utilization)   02

      c) Identify and comment – (Plant utilization)   02

      d) Identify and comment (Plant utilization)   02

      e) Identify and comment (Plant utilization)   02

Q. 6)   a) Journal   10

      b) Horticultural term paper   10

                                                   70

Solapur University, Solapur
Nature of Question Paper forCredit-Grading Semester Pattern
• Faculty of Science
B.Sc.II
(w.e.f. June 2015)
Time: - 3.0hrs. Total Marks- 70

Q. No.1) Multiple choice questions. (10)
      1) ---
        a)   b)   c)   d)
      2)
      3)
      4)
      5)
      6)
      7)
      8)
      9)
      10)

Q.No.2) Answer any five (out of seven)of the following.(15)
      i)
      ii)
      iii)
      iv)
      v)
      vi)
      vii)

Q.No.3) Answer any three(outof four) of the following. (15)
      i)
ii)
      iii)
      iv)

Q.No.4) Answer any three(out of four) of the following. (15)
      i)
      ii)
      iii)
      iv)

Q.No.5) Write short notes on any**three(out of four) of the following.** (15)
      i)
      ii)
      iii)
      iv)

Solapur University, Solapur
B.Sc. Part-II
Chemistry
Credit and Grading System
In force from June-2015

General Structure :

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

N. B.

i. Figures shown in bracket indicates the total number of contact hours required for the respective topics
ii. The question paper should cover the entire syllabus. Marks allotted questions should be in proportion to the number of contact hours allotted to respective topics.
iii. All topics should be dealt with S.I units.
iv. Use of scientific calculator is allowed.
v. Industrial tour is prescribed.

Semester-III

Paper-III : Organic Chemistry (70 marks)

Paper-IV : Inorganic Chemistry (70 marks)

Semester-IV

Paper-V : Physical Chemistry (70 marks)

Paper-VI : Analytical & Industrial Inorganic Chemistry (70 marks)

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

A) Distribution of marks :

a) Physical   : 45 marks (35 marks physical experiment + 5 marks oral + 5 marks Journal)
b) Inorganic   : 50 marks
                  I (25 marks gravimetric analysis + 15 marks preparation + 5 marks oral + 5 marks Journal)
                 II(25 marks for semimicro qualitative analysis+15 marks volumetric estimation + 5 marks oral+ 5 marks Journal).
c) Organic   : 45 marks (20 marks for organic qualitative Analysis + 15 marks estimation/preparation+5 marks oral + 5 marks Journal)

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

Semester-III
Paper-III :Organic Chemistry

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.

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.

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 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation..

5. Ethers and Epoxides (5)
   5.1. Ethers : Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical reactions of anisole with HI, Gravimetric estimation of $–OCH_3$ group by Ziesel's method (Related problems are expected based on % of $–OCH_3$ and number of $–OCH_3$ groups).

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

6. Carboxylic acids **(7)**

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

6.2. Hydroxy acids : Malic acid and citric acid, Methods of formation of malic acid from acid and moist Ag_2O. 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 of acrylic acid from acrolein and by dehydration of -hydroxyl propionic acid. Reactions of acrylic acid – Addition of H_2O reduction by Na / C_2H_5OH. Uses of acrylic acid. Methods of formation of 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-IV- Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

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].CoCl3.6NH3 b] CoCl3.5NH3, c] CoCl3.4NH3, d]CoCl3.3NH3

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.

3. Acids and Bases **(07)**

3.1 Lewis Concept : A.Definition, B.classification,C. merits and D.demerits.

3.2 Hard and soft acids and bases (HSAB) :

   A. Classification of acids and bases as hard and soft,

   B. Pearson's HSAB concept,

   C. Acid-Base strength and hardness-softness,

   D. Applications and limitations of HSAB principle.

4. Study of d-block elements **(15)**

5.1. Introduction,

5.2. Position of d-block elements in periodic table,

5.3.Names & electronic configuration of 1st, 2nd & 3rd three transition series.

5.4. General Characteristics of 3 d-block elements w.r.t. –

   a) oxidation state b) colour c) Magenetic behavior (spin only formula)

   d) catalytic properties   and   e) tendency to form complexes.

5.5. Comparison of 1st transition series with 2nd & 3rd transition series w.r.t. –

a) electronic configuration   b) reactivity   c) stability of oxidation state
d) magnetic behavior and   e) stability of complexes (Brief account only)

Reference Books :
1. Concise Inorganic Chemistry by J.D. Lee ELBS 4th & 5th Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.
4. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
5. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
6. Inorganic Chemistry by Agrawal.
7. Industrial Chemistry by B.K. Sharma.
8. Environmental Chemistry by S.M. Khopkar (Wiley Eastern Ltd.)
9. Environmental Chemistry by A.K. De (Wiley Eastern Ltd.)
10. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
11. Selected topics in Inorganic Chemistry : Madan, Malit Tuli, S. Chand & Company.
12. Environmental chemistry by B.K. Sharma.
13. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
14. Vogel'sText Book of QuantativeInorganic Analysis–Bassett,Denny,Jefferyy Mendham.
15. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Semester-IV
Paper-V- Physical Chemistry

Total Credits : 3
(45 Contact hrs.)

1. **Electrochemistry :** **(17)**
   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** **(09)**
   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.

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. **Physical Properties of Liquids** **(09)**
   4.1. Introduction, Additive and constitutive properties
   4.2. Dipole moment, Electrical polarization of molecules.
   4.3. Use of dipole moment in the study of molecular structure.

4.4. Refractive index, Snell's law.

4.5. Specific and Molecular refractivities; Abbe's refractometer : principle – Critical angle phenomenon, construction, working and advantages.

4.6. Molecular refractivity and chemical constitution, optical exaltation.

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 Thermidynamics : 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 – Samuel Glasstone (2nd Edn. Mac Millan)
13) Elements of Physical Chemistry – P. Atkins & J. Paula (Oxford IVth Edn.)
14) Principles of Physical Chemistry : Puri, Sharma and Pathania
15) Electrochemistry : S. Glasstone

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

Total Credits : 3
(45 Contact hrs.)

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 (in detail direct titration) ,

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

2. Gravimetric Analysis: (10)

2.1. Introduction

2.2. Precipitation – Conditions of Precipitation
                        Physical nature of Precipitate.

2.3. Process of precipitation – i) Nucleation   ii) Crystal growth   iii) Digestion

2.4. Coprecipitation and Post precipitation

2.5. Role of Organic precipitants in gravimetric analysis –
         i) DMG   ii) Aluminon iii) 8- hydroxyl quinoline.

3.Catalysis : (06)

3.1 Introduction;

3.2 Classification of catalytic reactions : Homogeneous & Heterogeneous

3.3 Types of catalysis;

3.4 Characteristics of catalytic reactions;

3.5 Mechanism of catalysis :

         i) Intermediate compound theory

         ii) Adsorption theory.

3.6 Industrial applications of catalysis.

4.Water Pollution & its Treatment (07)

4.1. Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources
      (Brief Account)

4.2. Treatment of water :

   A. Potable Water : Parameters of potability of water

      Step I : Removal of suspended matter :

            a) Prolonged storage   b) Screening

            c) Sedimentation   d) Coagulation

e) Filtration

Step II : Removal of germs & bacteria- Physical & Chemical method.

Physical Methods :   a) Boiling b) Exposure to UV or Sunlight

c) Distillation.

Chemical Method : a) Chlorination   b) Fluorination

c) Ozonisation   d) Aeration

e) Use of $KMnO_4$

B. Industrial Water : Mention names of methods only,

Ion exchange method in detail.

C. Munciple Sewage : Meaning of Sewage; Mention the names of methods;

Activated sludge process in detail.

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

5.1. Introduction

5.2. Physicochemical Principles & manufacture of following

i) Ammonia by Haber process

ii) Sulphuric acid by contact process.

6. Steel   **(05)**

6.1. Definition,

6.2. Types of Steel.

6.3. Manufacture of Steel –   a) Bessemer process   b) L. D. rocess

6.4. Heat treatment on steel.

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.   Environmental Chemistry by S.M. Khopkar (Wiley Eastern Ltd.)
9.   Environmental Chemistry by A.K. De (Wiley Eastern Ltd.)
10. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
11. Environmental chemistry by B.K. Sharma.
12. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
13. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jefferyy Mendham.
14. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Laboratory Course (Practicals) Physical Chemistry

University practical Examination   :   140 marks

Internal practical Examination   :   60 marks

Total   200 Marks = Credits : 4

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

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

* Internal Examination :

Practical paper has 60 marks for Internal Examination.

There will be **three** practicals of 20 marks each.

1. Physical Chemistry Expt   :   20 marks
2. Inorganic Chemistry Expt :   20 marks
3. Organic Chemistry Expt   :   20 marks

Note : i) Use of Electronic / Single pan balance / Digital balance is allowed.

ii) Use of scientific calculator is allowed.

iii) Use S.I. Units wherever possible.

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 concentractions)

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 a
      Ammonium sulphate and free sulphuric acid.

   ii. Gravimetric estimation of Ba as $BaSO_4$ from a solution containing barium chloride and free hydrochloric acid.

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

   i. Fertilizer analysis : To determine the percentage of nitrogen present in a given sample of nitrogenous fertilizer.

   ii. Quality control – To determine percentage purity of soda ash in the given sample.

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

3. **Inorganic Preparations :**

   i. Ferrous Ammonium Sulphate (Mohr's salt)

   ii. Tetrammine Copper (II) sulphate

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

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

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

Reference Books :

1. Quantative Inorganic Chemistry – A.I. Vogel.
2. Practical Chemistry – Physical – Inorganic – Organic and Vice-voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.
3. Inorganic Qualitative Analysis – A.I. Vogel.
4. Basic Concepts in Analytical Chemistry – S.M. Khopkar.

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 aspirin from aspirin 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.

Solapur University, Solapur.
Semester Pattern (CGPA Pattern)
Syllabus
(w.e.f. June 2015)
B.Sc.II-MATHEMATICS

- There will be **Two** theory Paper in **each semester.**

- **Three Theory periods** per week for **each section of theory paper**.

- **Three periods** per week for a **Problem Solving Session[PSS – IIA & IIB**].

Theory Papers:

Semester – III

Paper – III Differential   Calculus

Paper – IV Real Analysis

Semester – IV

Paper –V Differential Equation

Paper –VI Abstract Algebra-I

Problem Solving Session – II [

PSS – IIA Differential Calculus and Differential Equation

PSS – IIB Real Analysis and Abstract Algebra-I

(Three Hours in a week with whole Class as a Batch)

Four Theory Papers (Paper-III, IV)

Each paper (Annual 70 + Internal 30 = 100)   [100 x 2]   **Marks 400**

Problem Solving Sessions (PSS – IIA and IIB)

Each carrying[Annual 70 + Internal 30 = 100]   **Marks 200**

                                        Total : Marks 600

Semester -III
Paper – III Differential   Calculus

Unit-1. Curvature :
Definition of Curvature ,Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations.   **(15)**

Unit-2. Jacobians:
Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function,

Condition of dependent functions (statement only).   (**15**)

Unit- 3. 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.   **(15)**

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

Unit 1 :14.1,14.2,14.3.

Unit 2 :12.1,12.2,12.3,12.4

Unit 3 : 9.1,9.2,9.3,9.4, 9.6.(Examples restricted upto two variables only)

Reference Books
1. Differential   Calculus (B. Sc. Part-II: Semester-III Paper – III) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by 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 -IV : 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 (without proof and Examples)
7. Logarithmic Test (without proof and Examples)
8. Integral Test (without proof and Examples)
9. Gauss's Test (without proof and Examples)

Recommended Book (Scope of Syllabus):

Mathematical Analysis by S. C. Malik and Savita Arora(Third Revised Edition- 2008) New Age International Publishers.

Real Analysis

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

Semester – IV

Paper – V : 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 (Part –I) :
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. **(12)**

Unit 3 : Linear Equations of the second order & Homogeneous linear equations(Part –II) :

Transformation of the linear equation of second order by Changing the independent variable,

Homogeneous linear equations, Working rule for finding the solution, Equations reducible to

Homogeneous form. **(13)**

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.

Reference Book:
1. Differential Equations (B. Sc. Part-II: Semester-IV Paper – V) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.

Paper– VI : Abstract Algebra-I

Unit-1: Introduction to Groups   **[10]**

Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

Unit -2: Equivalence, Congruence, Divisibilty   **[12]**

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   **[13]**

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

Unit – 4 : Ch- V :21,22,23

Reference Books:

1. Abstract Algebra-I (B. Sc. Part-II: Semester-IV Paper – VI) Prof. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S., Prof. Mahimkar R. D. by Nirali Prakashan, Pune.
2. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education 7th edition.
3. University Algebra N.S. Gopalkrishnan.
4. Algebra M. Artin Prentice Hall of India.
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.
7. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

Problem Solving Session - II
[PSS – IIA :Differential Calculus and Differential Equation
PSS – IIB: Real Analysis and Abstract Algebra – I]

PSS – IIA: Differential Calculus and Differential Equation

Assignment No.1: Curvature -I

Assignment No.2: Curvature -II

Assignment No.3 : Jacobians-I

Assignment No.4 : Jacobians-II

Assignment No.5 : Maxima and Minima-I

Assignment No.6 : Maxima and Minima-II

Assignment No.7: Differential Equations of the first order and of degree higher than the first(Part-I) .

Assignment No. 8: Differential Equations of the first order and of degree higher than the first(Part-I) .

Assignment No.9: Linear Equations of the second order(Part-I)

Assignment No.10: Linear Equations of the second order (Part-II)

Assignment No.11: Simultaneous Equations & Total Differential Equations(Part-I)

Assignment No.12: Simultaneous Equations & Total Differential Equations(Part-II)

PSS –IIB : Real Analysis and Abstract Algebra – I

Assignment No.1: Real Numbers(Part-I)

Assignment No.2 : Real Numbers (Part-II)

Assignment No.3 : Real Sequences (Part-I)

Assignment No. 4 : Real Sequences (Part-II)

Assignment No. 5: Infinite Series(Part-I)

Assignment No. 6: Infinite Series(Part-II)

Assignment No. 7: Equivalence, Congruence, Divisibilty

Assignment No. 8: Equivalence, Congruence, Divisibilty

Assignment No.9: Groups(Part-I)

Assignment No.10: Groups(Part-II)

Assignment No.11: Group Homomorphism(Part-I)

Assignment No.12: Group Homomorphism(Part-II)

Nature of question paper
For Each Theory Paper

External /Annual Examination [70] + Internal [30] = 100 Marks

1. **Internal : Unit Test [20] + Tutorial [10]**   [30]

2.   **External : One paper of 70 marks in each semester.**

(As per Solapur University Pattern)

Problem Solving Session- II [PSS- IIA and PSS-IIB]

Examination of 3 hours each PSS- IIA and PSS-IIB (for a batch of 20 to 30 students) at the end of the year. And External /Annual Examination [70] + Internal [30] = 100 Marks for each PSS- IIA and PSS-IIB

1.   **Internal : Practical [20] + Journal [10]**   [30]

2.   **External : One paper of 70 marks in each semester. Nature is as follows:**

Problem Solving Session - II [PSS – IIA and PSS- IIB]

Attempt any 7 out of 10 (10 marks each). Ten questions contains 5 questions from each section.

Total   (200 marks)

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SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II

Subject: Physics (New CGPA Pattern syllabus)

With effect from - June 2015

NB:

1. There will be four theory papers, each of 100 marks. (Paper III & IV for semester III and Paper V & VI for semester IV). Annual practical will be for 200 marks. Total marks for physics will be 600 (400 marks for theory and 200 marks for practical). Assessment system for both theory and practical will be 70 % UA and 30 % CA.

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 70 marks will be 3 hours each and that for the practical examination will be 12 hours means 4 sessions of 3 hours each.

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

5. The theory examination of paper V and VI will be held at end of semester IV.

6. The practical examination of the both terms 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 30 % CA of both theory & practical has to submit in the University by the Colleges before announcement of University examination.

Titles

Semester – III

Paper – III	General Physics, Heat and Sound	100 (70 % UA + 30 % CA) Marks
Paper –IV	Electronics	100 (70 % UA + 30 % CA) Marks

Semester – IV

Paper – V	Optics	100 (70 % UA + 30 % CA) Marks
Paper – VI	Modern Physics	100 (70 % UA + 30 % CA) Marks

Annual Practical at the end of Fourth semester   200 (70 % UA + 30 % CA) Marks

[UA(University Assessment): Four groups each of 30 marks and 20 Marks for Journal;   CA(College Assessment): 60 Marks]

Semester III

Physics Paper III - General Physics, Heat and Sound

1. **Vectors:**   [08]
   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, curl of vector and their physical significance

2. **Precessional Motion: -**   [08]
   2.1 Precession
   2.2 Nutation
   2.3 Gyroscope
   2.4 Lanchester's rules
   2.5 Gyrostatic pendulum
   2.6 Motion of rolling disc
   2.7 Gyroscopic applications in brief

3. **Elasticity: -**   [08]
   3.1 Bending of a beam
   3.2 Bending moment
   3.3 Cantilever
   3.4 Centrally loaded beam
   3.5 Flat spiral spring expression for Y and η

4. **Viscosity: -**   [05]
   4.1 Viscosity of liquid by rotating cylinder method
   4.2 Searle's viscometer
   4.3 Ostwald's viscometer

5. **Heat:**   [06]
   5.1 Entropy
   5.2 Change in entropy
   5.3 Physical concept and physical significance of entropy
   5.4 T – S diagram
   5.5 Entropy of a perfect gas
   5.6 Entropy of a steam

6. Sound: [10]

    6.1 Transducer

    6.2 Pressure microphone

    6.3 Moving coil Loudspeaker

    6.4 Acoustics and its affecting factors

    6.5 Reverberation time

    6.6 Optimum reverberation time

    6.7 Requirements of good acoustics

    6.8 Sabine's formula

    6.9 Ultrasonic production by piezoelectric method

    6.10 Detection of ultrasonic

    6.11 Properties and applications of ultrasonic

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. Heat, Thermodynamics and Statistical Physics – Brijlal & Subramanyam S Chand Publicaton
8. Mathematical Physics – Rajput & Gupta
9. Engineering Physics Part I – Selladurai PHI Learning Pvt. Ltd, New Delhi

Semester III

Physics Paper IV - Electronics

1. Transistor amplifier :   [10]

    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 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 :   [8]

    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: [07]

    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. Digital Electronics :   [06]

    4.1 De Morgan's theorems

    4.2 Half adder

    4.3 Full adder

    4.4 Construction and working of RS flip flop

    4.5 Construction and working of JK flip flop

5 . Regulated power supply   [07]

    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

6. Electronic Instruments: [07]

    6.1 Principle, Construction and working of CRT

    6.2 Block diagram of CRO

    6.3 Uses of CRO

    6.4 Block diagram of digital multimeter (DMM) and its applications

REFERANCE BOOKS:

1. Principles of electronics - V.K. Mehta

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

3. Digital principles and application (4th edition) - Malvino and Leach.

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

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

Semester IV

Physics Paper V - Optics

1. Cardinal points: **[8]**

    1.1 Lagrange's equation
    1.2 Cardinal points of optical system
    1.3 Graphical construction of image using cardinal points
    1.4 Newton's formula
    1.5 Relation between focal lengths for any optical system
    1.6 Relation between lateral, axial and angular magnifications
    1.7 Thick lens (introduction)
    1.8 combination of two thin lenses

2. Interference of light: **[7]**

    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 Construction and working of Fabry Perot interferometer
    2.4 Superiority of F.P. interferometer over Michelson's interferometer

3 . Diffraction of light: **[7]**

    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

4. Resolving power: **[7]**

    4.1 Geometrical and spectral resolution
    4.2 Distinction between magnification and resolution
    4.3 Rayleigh's criterion for the limit of resolution
    4.4 Modified Rayleigh's criterion
    4.5R.P. of plane diffraction grating
    4.6 R.P. of prism

5. Polarization: [10]

    5.1 Double refraction

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

    5.3 Nicols prism

    5.4 Phase retardation plates

    5.5 Elliptically and circularly polarized light

    5.6 Optical rotation

    5.7 Laws of rotation of plane of polarization

    5.8 Applications   a) Polarimeter

                             b) Liquid crystal Displays (LCDs)

6. Optical Fibers: [6]

    6.1 Structure and types of fibers

    6.2 Numerical aperture (definition only)

    6.3 Pulse dispersion in step index fiber

    6.4 Fiber optic communication system (Qualitative treatment only)

    6.5 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 VI - Modern physics

1. **Theory of relativity:** [13]
   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:** [7]
   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:** [13]
   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: [05]

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: [07]

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 (List of Physics Experiments)

(With effect from - June 2015)

Group I (General Physics, Heat and Sound)

1. Young's Modulus (Y) by bending.
2. Y or η 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. J by Electrical 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 at straight edge
10. Wedge shaped film: Measurement of thickness

Group IV (Electricity, Magnetism and Modern Physics):

1. Constants of B.G.
2. Comparison of Capacities
3. Mutual Induction of two coils
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 series circuit
8. Sharpness of series resonance circuit
9. Study of Characteristics of G M tube and determination of its operating voltage, platue length slope etc
10. Verification of inverse square law for gamma rays

NB: At least seven experiments from each group are required to certify the journal. 20 Marks for certified journal should not be given in case of lost certificate. Such students may appear the practical examination of 140 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.

NATURE OF THEORY QUESTION PAPER FOR NEW SEMESTER & CGPA PATTERN
(With effect from June – 2015)

Time: - 3 hrs   **Total marks: -70**

Q.No.1) Choose and write a correct answer from given four alternatives.   **(10)**
      1) --
             a)…………….b)…………….c)………………..d)……………
      2)
      3)
      4)
      5)
      6)
      7)
      8)
      9)
      10)

Q.No.2) Solve any five of the following   **(15)**
      1)
      2)
      3)
      4)
      5)
      6)

Q.No.3) A) Solve any three of the following   **(15)**
      1)
      2)
      3)
      4)

Q.No.4) Solve any three of the following   **(15)**
      1)
      2)
      3)
      4)

Q.No.5) A) Answer any one of the following long answer questions   **(10)**
       1)
       2)
   **B) Solve any one problem**   **(05)**
      1)
      2)

Instructions to be strictly followed by paper setters: -
   1. Two numerical based sub-questions must be asked in question number one.
   2. One mathematical example of 3 marks must be asked in question number two.
   3. One mathematical example of 5 marks must be asked in both question number 3 & 4.
   4. Weightage for each topic must be given as per periods allotted to complete the topic.

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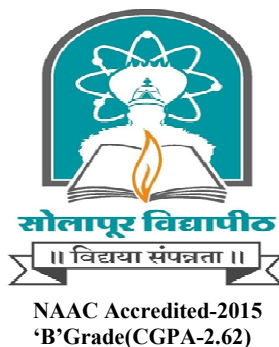
B.Sc. Part- II ZOOLOGY

Semester III and IV

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

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

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

• **Subject:** Zoology

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

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

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

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

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

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

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

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

➢ Scientific Research Organizations.

➢ Universities in India & aboard

Solapur University, Solapur

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

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

General Guidelines for Choice Based Credit System (CBCS)

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

1. The University follows Semester system

2. An academic year shall consist of two semesters

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

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

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

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

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

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

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

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

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

Internal Continuous Assessment (30 Marks):

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

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

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

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

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

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

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

Solapur University, Solapur

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

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

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

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

Q.No.2) Answer any five (out of seven) of the following   (14)

i)
ii)
iii)
iv)
v)
vi)
vii)
viii)
xi)

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

i)
ii)
iii)

   B)   (4)

Q.No.4) Attempt any two of the following   (14)

i)
ii)
iii)
iv)

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

i)
ii)
iii)

SOLAPUR UNIVERSITY, SOLAPUR

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

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

SEMESTER-III
THEORY

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

SEMESTER-IV
THEORY

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

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

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

UA- University Assessment
CA- College Assessment

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

Unit No.I	**Taxonomy:** Salient features and Classification up to classes of the following with suitable examples: Arthropoda, Mollusca, Echinodermata and Hemichordata	**05**

Unit No.II	**Type Study- 1. Cockroach (Phylum-Arthropoda)** i) Systematic Position ii) Habit and Habitats iii) External Morphology iv) Study of the following systems: a) Digestive system b) Respiratory system c) Circulatory system d) Nervous system and compound eye e) Excretory system f) Reproductive systems v) Economic importance	**15**

Unit No.III	**Type Study- 2. Pila (Phylum-Mollusca)**
	i) Systematic position
	ii) Habit and Habitats
	iii) External morphology: Shell and Pallial Complex
	iv) Study of following systems:
	  a) Digestive system
	  b) Respiratory system
	  c) Blood Vascular System
	  d) Nervous system and Sense organs-Eye, Osphradium, Statocyst
	  e) Excretory system
	  f) Reproductive systems
	v) Economic importance
		15

Unit No.IV	**A)** Study of Insect mouth parts: Cockroach, Honeybee, House fly, Butterfly and Mosquito **B)** Mosquito as insect vector in human diseases with reference to : Malaria, Filaria, and Dengue disease (Prevention, Control measures and Treatment expected).	**05**

Unit No.V	a) Study of Foot in Mollusca
	b) Affinities in Hemichordata
	c) Amazing invertebrates –
	   Offence and defence mechanism – Ink gland in Sepia
	   Bioluminescence — Firefly
		05

List of Recommende Books:

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

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

Paper-VI- Cell Science, Genetics, Biological Chemistry and Economic Zoology

Contact Hours:45
Total credits-3

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

Unit No.II **Genetics-** **03**
i) **Linkage:** Definition ,Complete linkage and Incomplete linkage with examples of *Drosophila*
ii) Mechanism of Crossing over and its Significance
iii)Gene interaction -
   a) Supplementary genes
   b) Complementary genes
iv) Human genetics : Human chromosomal disorders
   a) Downs syndrome
   b) Turners syndrome
   c) Klinefelter syndrome

Unit No.III **Biological Chemistry-** Biomolecules- (Definition, Structure, Types and **05**
Biological significance):
i) Carbohydrates
ii) Proteins
iii) Lipids
iv) Nucleic Acids (DNA and RNA)

Unit No.IV **Economic Zoology-** **05**
1) Economic Fishery
i) Fresh water Fish farming- Construction and Maintenance
ii) Economic importance of fishes
iii) Maintenance of glass aquarium and ornamental fishes

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

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

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

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

6) Goat Farming
i) Breeds
ii) Feeding   **05**
iii) Housing
iv) Economic importance

List of Recommended Book :

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

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

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

| Unit No.II | **Type study: 1. Rat** | **20** |

i) Systematic position
ii) Habit and Habitats
iii) External Morphology
iv) Study of following systems:
   a) Digestive system
    b) Respiratory system
    c) Circulatory system
    d) Excretory system
    e) Nervous system- Brain and Spinal cord
    f) Sense Organs – Eye and Ear
    g) Reproductive systems (Male and Female)

| Unit No.III | **Study of general topics:** | **10** |

A. Mesozoic reptiles: Dinosaurs
a) Aquatic : Ichthyosaurs and Plesiosaurs
b) Terrestrial : Pterosaurs, Herbivorous (Brontosaurus) and Carnivorous (Tyranosaurus)
B. Salient features and affinities: Monotremes and Marsupials
C. Dentition in mammals: Introduction, Herbivorous, Carnivorous and Omnivorous with examples

| Unit No.IV | **Poisonous and non-poisonous snakes:** | **05** |

a) Identification features with examples
b) Poison apparatus
c) Venom : its effects and medicinal uses
d) Anti-venom production
e) First aid treatment of Snake bite

| Unit No.V | i) Archaeopteryx | **05** |

ii) Aerial adaptations in birds
iii) Beak and Leg modification in birds
iv) Migration in Birds

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

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

Unit No.I	**Study of Tissues** (Study of following tissues with reference to origin, location and functions) i) Epithelial ii) Connective iii) Muscular iv) Nervous	**05**
Unit No.II	**Histology of following mammalian organs:** i) Tooth ii) Tongue iii) Salivary gland iv) Stomach v) IIeum vi) Liver vii) Pancreas viii) Kidney ix) Testis x) Ovary xi) Uterus	**15**
Unit No.III	**Reproductive physiology:** i) Pituitary gland and its hormones ii) Sex hormones iii) Oestrous cycle iv) Menstrual cycle v)Hormonal control of pregnancy, parturition and lactation vi) Hormonal control of testicular activity vii) *In-vitro* fertilization viii) Amniocentesis	**10**
Unit No.IV	**Study of Contraceptives: Male and Female** i) Natural methods : Abstinence, Rhythm ii) Mechanical methods: Condom, Diaphragms iii) Chemical methods: Tablets , Creams iv) Intra uterine device: Copper – T v) Oral contraceptives – Pills vi) Surgical methods : Tubectomy , Vasectomy	**05**
Unit No.V	**Body defense mechanism-** A) Organs involved in immune system a) Primary lymphoid organs : Bone marrow and Thymus b) Secondary lymphoid organs: Lymph nodes , Spleen , Tonsil B) Immune system i) Humoral immunity and its mechanism a) B-Cell Immunity b) Typical structure of antibody and its types ii) Cellular immunity and its mechanism a) Types of T-Cell b) T-Cell Immunity	**10**

List of Recommended Books:

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

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

Practical – I   Total credits-2

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

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

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

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

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

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

VII.   Study of mitosis using onion root tip

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

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

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

XI.   Colorimetric estimation of protein by biuret method

XII.   Colorimetric estimation of glucose by suitable method

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

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

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

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

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

Practical –II   **Total credits-2**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Excursion Tour : Six days tour is recommended

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

OR

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

Note:

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

Equivalence of the new CBCS Course

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

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

PRACTICAL I :

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

PRACTICAL II:

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