SOLAPUR UNIVERSITY, SOLAPUR

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

CBCS

Pattern Syllabus

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

BOTANY

With effect from June-2017

SOLAPUR UNIVERSITY, SOLAPUR

Proposed Syllabus for B.Sc.Part-II (CBCS Semester pattern)

BOTANY

(Introduced from June 2017)

Introduction:

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing under graduate degree, Solapur University has implemented Choice Base Credit System of Evaluation at Undergraduate level.

The main objective of this course is to introduce CBCS semester system to the B.Sc-II (Botany) students which covers the basic concepts of Anatomy and Taxonomy of Angiosperms, Plant Ecology, Plant Physiology and Cytogenetics and Economic Botany.

B.Sc-II (Botany) CBCS Semester wise pattern to be introduced from June 2017. This syllabus of Botany carries 600 marks. In semester-III, university examination of theory papers V and VI and in semester-IV, university examination of theory papers VII and VIII. The university examination of practical-I based on paper-V, VI and practical-II based on paper-VII, VIII will be held annually. The distributions of marks are as below.

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.

Semester No.	Paper No.	Title of the Paper	University Exam.	Internal Exam.	Total
III	BOTANY PAPER-V	Anatomy and Taxonomy of Angiosperms.	70	30	100
	BOTANY PAPER-VI	Plant Ecology.	70	30	100

IV	BOTANY PAPER-VII	Plant Physiology and Cytogenetics.	70	30	100
	BOTANY PAPER-VIII	Economic Botany.	70	30	100
Annual Examination	BOTANY PRACTICAL	Botany Practical-I Based on Paper-V, VI	70	30	100
		Botany Practical-II Based on Paper-VII, VIII	70	30	100

Note: Nature of Internal examination, Passing standard, ATKT and the conversion of marks into grades and credits are as per guidelines of Science Faculty Credit and Grading Syste.

Teaching Periods:

(1) Total teaching periods for each theory paper is six periods per week.

(2) Total teaching periods for each practical-I and practical-II are eight periods per week per batch of 20 students.

Duration of University Examinations:

1. For theory paper-V and VI: Two and half hours in semester-III.
2. For theory paper-VII and VIII: Two and half hours in semester-IV.
3. For practical-I: Four hours for a batch of 20 students annually.
4. For practical-II: Four hours for a batch of 20 students annually.

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper – III: Structural Botany & Taxonomy of Angiosperms	Paper – V: Anatomy and Taxonomy of Angiosperms
2)	Paper-IV: Plant Ecology	Paper-VI: PLANT ECOLOGY
3)	Paper –V: Plant Physiology and Cytogenetics	Paper –VII: Plant Physiology and Cytogenetics
4)	Paper-VI: Utilization of Plant	Paper-VIII: Economic Botany

SOLAPURUNIVERSITY, SOLAPUR

B.Sc. Part – II (Botany)

w.e.f.- JUNE, 2017

Semester – III

Paper – V: Anatomy and Taxonomy of Angiosperms (45 Periods)

Unit-1: Apical Meristem: 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: Tissue systems and their functions: 07

3.1 Epidermal Tissue System

3.2 Secretory Tissue System

3.3 Mechanical Tissue System

Unit-4: Secondary body of the plant **8**

4.1 Normal Secondary growth in Dicot root and stem.

4.2 Periderm, Lenticels and Annual rings.

4.3 Basic structure of wood and its types.-

Unit-5: Taxonomy of Angiosperms **16**

5.1 Morphology of Inflorescence, Flower, Fruit.

5.2 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) Asclepiadaceae c) Amaranthaceae d) Liliaceae.

References Book:-

Paper – V: Anatomy 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. Cambridge University, 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.
23. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.
24. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
25. Jeffrey, C. (1982). An introduction to plant Taxonomy, Cambridge University Press, Cambridge.
26. Judd, W.S., Campbell, C.S., Kellog, E.A., Steven, P.F. (2002). Plant Systematics-A Phyllogenetic approach. Sinauer Associates Inc., U.S.A. 2nd edition.
27. Maheshwari j.k. (1963). Flora of Delhi. CSIR, New Delhi.

Paper-VI: PLANT ECOLOGY

(45 Periods)

Unit-1: Introduction **06**

1.1) Climatic factors**.**

1.2) Edaphic factors

Unit-2:CommunityEcology- **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 Control measures.

References Book:-

Paper-VI: PLANT ECOLOGY

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 –VII: **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: Nitrogen metabolism **08**

2.1 Introduction

2.2 Nitrogen cycle

2.2 Biological N_2 fixation – Definition, types & organisms involved

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

2.5 Significance of Biological Nitrogen fixation.

Unit-3: **Genetics** **12**

3.1) Introduction, terminolgy

3.2) Medelism – History,

3.3) Principles of inheritance – i. Law of dominance, ii. Law of purity of gametes, iii. Law of independent assortment.

3.4) Gene interaction – a. Definition, b. types – complementary, supplementary and inhibitory genes.

Unit-4: **Classical genetics** **6**

4.1) Linkage-Definition, Kinds of Linkage-complete, incomplete and linkage groups, Significance of linkage.

4.2) Crossing over-Definition, Mechanism of crossing over, 'Break and exchange' theory, (Stern and Hotta, 1969), Significance of crossing over.

Unit: 5 Multiple allelism **7**

5.5) Introduction and definition.

5.2) Eye colour in *Drosophila*.

5.3) Blood groups in man.

5.4) Self incompatibility in plant.

References Book:-

Paper –VII: Plant Physiology and Cytogenetics

1. Hopkins, W. G. 5995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
2. Moore, T. C. 5989. Biochemistry and Physiology of Plant Hormones (2^{nd} edition). Springer – Verlag, New York, USA.
3. Salisburry, F.B. and Ross, C.W. 5992. Plant Physiology (4^{th} edition). Wadsworth Publishing Co., California, USA.
4. Taiz, L. and Zeiger, E. 5998. Plant Physiology (2^{nd} edition) Sinauer Associates, Inc., Publishers, Massachusetts, USA.
5. R.C. Grewal – Plant Physiology Campus Brokes International 482/24, Prahiad street Ansari Road, Darya ganj, New Delhi – 550002.
6. V.K. Jain – Fundamentals of Plant Physiology, S. Chand & Company Ltd. Ramnagar, New Delhi – 550055.
7. Salisbury Ross – Plant Physiology CBS, Publishers & Distributions 485/ Jain Bhawan, BholeNath Nagar, Shahdara, New Delhi – 550022.
8. Devlin & Witham – Plant Physiology CBS Publishers & Distributors 485, Jain Bhavan, BholeNath Nagar, Shahdara, New Delhi – 550022.
9. G. Ray Noggle / G. Fritz Introductory Plant Physiology Prentice Hall of India Ltd. New Delhi – 550005.
10. V.Verma. Text Book Of Plant Physiology. Emkay Publications.,B-59,East Krishna Nagar, Delhi-5500055.
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.550002.
13. D.O.hall& K.K. Rao. Photosyntheis. Edward Arnold, East Street, Baltimore, Mary-land-25202,U.S.A.
14. P.S Verma,V.KAgarwal,CellBiology,Genetics,Evolution and Ecology,S.Chand and Co.Pvt.Ltd.,Ramnagar,New Delhi,550055

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-550055.
17. P.S Verma, V K Agarwal;Genetics,S Chand and Co.Ramnagar,New Delhi-550055
18. Dr (Mrs.) Veer BalaRastogi,A text Book of Genetics,KedarnathRamnath road,Meerut-250005.
19. H.S.Bhamrah,KavitaJuneja,GeneticsandEvolution,AnmolPublication,Pvt.ltd.New delhi-550002.

Paper-VIII: Economic Botany (45 Periods)

Unit-1: Legumes: Botanical names, Morphology, Source and Economic importance of Pulses-Chickpea and Red gram, legumes - Lucerne and *Sesbania* **07**

Unit-2: Plant Fibers Botanical names, Morphology, Source and Economic importance of Cotton and Coir 07

Unit-3: Vegetable oil sources **07**

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

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

Unit -4:- Drug Yielding plants **07**

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

A) Rhizome – *Zingiber officinale*
B) Root –*Withania somnifera*
C) Stem – *Tinospora cordifolia*
D) *Leaf –Adhatoda zeylanica.*
E) Floral bud – *Syzigium aromaticum*
F) Fruit – *Emblica officinalis*

Unit-5:- Natural Products **09**

4.1) **Rubber** – Introduction, properties of rubber, source (*Hevea brasilensis*), 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 6: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 7: Plants perfumes and cosmetics **04**

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

Jasmine, Rose, Aloe

References Book:-

Paper-VIII: Economic Botany

1. R.C. Grewal – Medicinal plants, Campus Books International 4825/24, Prahiad street, Ansari Road, Darya Ganj, New Delhi – 550002. Fax : 95-055-2257825.

2. F.O. Bower – Plants and Man Ariana Publishing House, New Delhi – 550052.

2. Fuller, K.W. and Galon, J.r. 5985. Plant Products and New Technology. Calrendon Press, Oxford, New York.

4. Kocchar, S.L. 5998. Economic Botany in Tropics, 2nd edition. Macmillan India Ltd., New Delhi.

5. Sambamurthy, A.V.S.S. and Subramanyam, N.S. 5989. A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.

25. Sharma, O.P. 5996. Hill's Economic Botany. Tata McGraw Hill Publishing Company Ltd., New Delhi.

6. Simpson, B.B. and conner-Ogorzaly, M. 5986. Economic Botany – Plants in Our World. McGraw Hill, New York.

7. Tippo, O. and Stern, W.L. 5977. Humanistic Botany. W.W. Norton, New York.

8. B.P.Pandey Economic Botany. S.Chand& Company pvt. LTD. Ram Nagar New Delhi. 550055.

9. Bentley &Trimen. Medicinal Plants. Asiatic Publishing house, 585 D.J. Extension, Laxmi Nagar. Delhi. 550092.

50. Robert Brentley& Henry Trimen. Medicinal Plants. Londan J &AChureldill.NewRulington Street.

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

52. A Textbook of economic Botany (EDN 5989)

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

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

Publ. by Agro bios (India) Agrohouse Jodhpur 242002.

Solapur University, Solapur

PRACTICALS IN BOTANY AT B.Sc. Part – II

(w.e.f.- June 2017)

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	
5)	Structural Botany and Taxonomy of Angiosperms.	25Marks
2.)	Plant Ecology	25Marks
2.)	Journal	10 Marks
4.)	Tour report	10 Marks

Practical – II ---------- 70 Marks

5)	Plant Physiology and Cytogenetics	25 Marks
2.)	Utilization of Plant	25 Marks
2.)	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 Floral Formula and Foral Diagram.
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 – V &VI)

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

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

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

4. Anomalous secondary growth in *Bignonia* stem by using permanent double stainded technique.

5. Anomalous secondary growth in *Dracaena* stem by using permanent double stainded technique.

4. Maceration technique

5. Study of Epidermal tissue system.

6. Study of Mechanical tissue system.

7. Study of Secretory tissue system..

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

9. Morphology of Inflorescence

10. Morphology of Flower

11. Morphology of Fruit

12-15. Study of Angiosperm families as per syllabus.

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

17. Study of soil pH (any two soil samples)

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

19-20. Determination of density & frequency of different plant species by quadrat method.

21) Ecological adaptations in morphology and anatomy of hydrophytes –

Submerged-(*Hydrilla*) 2) Floating, (*Eicchornia*) 2) 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. To prepare report on any ecosystem from nearby locality (supplementary).

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

Practical No. II - (Based on Paper VII & VIII)

1) Separation of photosynthetic pigments by ascending Paper chromatography.

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

3) To study C_2 and C_4 plants by Kranz anatomy.

4) Estimation of TAN.

5) Study of root nodules in any legume crop.

6) Study of mendelian traits

7) Study of multiple alleles – eye colour in Drosophila (with the help of photographs)

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, seasonals 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 – theory syllabus 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.: 5. Draw near labeled sketches whenever necessary.

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

2. Record your observations carefully and neatly wherever asked.

Q. 5 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-2 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. 05

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

Or

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 05

b) Excursion report. 05

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. : 5. Draw near labeled sketches wherever necessary.

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

2. Record your observations carefully and neatly wherever asked.

Q. 5) 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-2) 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 – (Economic Botany)	02
c) Identify and comment – (Economic Botany)	02
d) Identify and comment (Economic Botany)	02
e) Identify and comment (Economic Botany)	02
Q. 6) a) Journal	05
b) Horticultural term paper	05

	70

SOLAPUR UNIVERSITY, SOLAPUR

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

Name of the Faculty: Science

Syllabus: Chemistry

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

CBCS

With effect from June- 2017

Solapur University, Solapur

B.Sc. Part-II

Chemistry

Choice Based Credit System (CBCS)

In force from June-2017

General Structure :

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

N. B.

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

Semester-III

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

Semester-IV

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

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

A) Distribution of marks :

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

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

Equivalent Subject for Old Syllabus

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

Semester-III
Paper-V: Organic Chemistry

Total Credits: 3
(45 Contact hrs.)

UNIT-I Credits: 1.6 Contact Hrs: 24

1. Spectroscopic Methods (8)

Ultra-Violet (UV) absorption:

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

2. Stereochemistry (8)

2.1. Geometrical isomerism: Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes.

2.2. Conformational Isomerism: Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae.

2.3. Conformational analysis of ethane and n-butane with the help of energy profile diagrams.

2.4. Nomenclature – D & L, R & S, E & Z systems

3. Alcohols and Phenols (8)

3.1. Alcohols : Introduction

i. Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, HIO_4 and nitric acid, Uses of ethylene glycol. Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism.

ii. Trihydric alcohols: Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol – reaction with electropositive metals, reaction with hydrogen halide HCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol.

3.2. Phenols : Introduction, Reactions of phenol (carbolic acid) :

i. Acylation and Fries rearrangement
ii. Ether formation and claisen rearrangement
iii. Gattermann Synthesis
iv. Carboxylation – Kolbe's reaction
v. Reimer – Tiemann reaction and its mechanism.

UNIT- II Credits: 1.4 Contact Hrs: 21

4. Aldehydes and Ketones (5)

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

5. Ethers and Epoxides (5)

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

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

6. Carboxylic acids (7)

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

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

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

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

7. Diazonium Salts (4)

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

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

Reference Books :

Latest editions of following reference books.

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

Semester-III
Paper-VI- Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

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

1. Co-ordination Chemistry : **(16)**

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

2. Chelation **(07)**

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

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

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

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

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

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

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

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

Reference Books :

1. Concise Inorganic Chemistry by J.D. Lee ELBS 4th & 5th Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.
4. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
5. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
6. Inorganic Chemistry by Agrawal.
7. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
8. Selected topics in Inorganic Chemistry : Madan, Malik Tuli, S. Chand & Company.
9. Vogel's Text Book of Quantitative Inorganic Analysis–Bassett, Denny, Jeffery Mendham.
10. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Semester-IV
Paper-VII- Physical Chemistry

Total Credits : 3
(45 Contact hrs.)

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

1. Electrochemistry : **(18)**

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

2. Thermodynamics **(10)**

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

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

3. The Solid State **(10)**

3.1. Introduction, space lattice, lattice sites, lattice planes, Unit Cell.
3.2. Laws of crystallography :
   i. Law of constancy of interfacial angles.
   ii. Law of rational indices
   iii. Law of crystal symmetry.
3.3. Weiss indices and Miller indices.
3.4. Cubic lattice and types of cubic lattice, planes or faces of a simple cubic system, spacings of lattice planes.
3.5. Diffraction of X-rays, Derivation of Bragg's equation.
3.6. Determination of crystal structure of NaCl and KCl on the basis of Bragg's equation.
3.7. Numerical problems.

4. Distribution Law **(07)**

4.1. Introduction

4.2. Nernst distribution law, its limitations and modification with respect to association and dissociation of solute in one of the solvents

4.3. Applications of distribution law in

i. Process of extraction (derivation expect)

ii. Determination of solubility

iii. Distribution indicators

iv. Determination of molecular weight

4.4. Numerical problems expected

List of Reference Books :

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

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

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

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

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

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

7) Physical Chemistry: Daniels – Alberty.

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

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

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

11) Physical Chemistry: S. Glasstone.

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

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

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

15) Electrochemistry : S. Glasstone

Semester-IV

Paper- VIII- Analytical & Industrial Inorganic Chemistry

Total Credits : 3
(45 Contact hrs.)

UNIT-I Credits: 1.33 Contact Hrs: 20

1. Volumetric Analysis : (10)

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

1.2 Acid Base Titration

i) Introduction

ii) Theory of Acid-Base indicator :

A) Colour change Interval

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

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

A) Strong acid and Strong Base

B) Strong Acid and Weak Base

C) Weak Acid and Strong Base

1.3 Complexometric titration :

A) General account,

B) Types of EDTA Titrations,

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

2. Gravimetric Analysis: (10)

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

2.2. General steps involved in gravimetry

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

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

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

2.6. Role of Organic precipitants in gravimetric analysis,

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

2.8. Advantages and disadvantages of organic precipitants.

UNIT-II Credits: 1.67 Contact Hrs: 25

3. Industrial heavy Chemicals (07)

3.1. Introduction

3.2. Physicochemical Principles & manufacture of following heavy chemicals:

i) Ammonia by Haber process

ii) Sulphuric acid by contact process.

4. Metallurgy **(08)**

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

4.2. Occurrence of metals: Types of ores

4.3. Steps involved in metallurgical processes:

A) Concentration of ores-

I. Physical methods:

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

II. Chemical Methods:

a) Calcination b) Roasting

B) Reduction- i) Chemical methods of reduction

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

5. Iron and Steel **(10)**

5.1 Occurrence of Iron

5.2 Extraction of Iron: Blast furnace

5.3 Types of Iron

5.4 Steel-

A) Definition

B) Types of Steel

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

D) Heat treatment on Steel

List of Reference Books :

1. Concise Inorganic Chemistry by J.D. Lee ELBS 4^{th} & 5^{th} Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
4. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
5. Inorganic Chemistry by G.S. Manku Tata Mc. Graw Hill.
6. Inorganic Chemistry by Agrawal.
7. Industrial Chemistry by B.K. Sharma.
8. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
9. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
10. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.
11. Basic concepts of Analytical Chemistry by S.M. Khopkar.

Laboratory Course (Practicals) Chemistry

University practical Examination : 140 marks

Internal practical Examination : 60 marks

Total 200 Marks = Credits : 4

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

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

*** Internal Examination :**

Practical paper has 60 marks for Internal Examination.

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

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

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

ii) Use of scientific calculator is allowed.

iii) Use S.I. Units wherever possible.

Laboratory Course Physical Chemistry

A) Instrumental

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

B) Non-Instrumental

1. Chemical Kinetics (ANY THREE)

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

2. Partition coefficient

To determine partition coefficient of benzoic acid between water and benzene

Reference Books :

1. Experimental Physical Chemistry by A. Findlay Longman.
2. Experiments in Physical Chemistry by R.C. Das & B. Behra. Tata Mc Graw Hill.
3. Advanced Experimental Chemistry Vol. I Physical by J.N. Gurtu and R. Kapoor S. Chand & Co.
4. Experiments in Physical Chemistry by J.C. Ghosh, Bharati Bhavan.
5. Practical book of Physical Chemistry – by Nadkarni Kothari Lawande. Bombay Popular Prakashan.
6. Systematic Experimental Physical Chemistry – by S.W. Rajbhoj, Chondhekar. Anjali Publication.
7. Practical Physical Chemistry – by B.D. Khosala & V.C. Garg R. Chand & Sons.
8. Experiments in Chemistry by D.V. Jagirdar.

Practical Course Inorganic Chemistry

1. **Gravimetric Analysis :**
   i. Gravimetric estimation of Fe as Fe_2O_3 from a solution containing ferrous ammonium sulphate and free sulphuric acid.
   ii. Gravimetric estimation of Ba as $BaSO_4$ from a solution containing barium chloride and free hydrochloric acid.
2. **Titrimetric Analysis :** Calibration of burette, pipette and volumetric flask.
   i. Fertilizer analysis : To determine the percentage of nitrogen present in a given sample of nitrogenous fertilizer.
   ii. Quality control – To determine percentage purity of soda ash in the given sample.
   iii. Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.
   iv. To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.
3. **Inorganic Preparations :**
   i. Ferrous Ammonium Sulphate (Mohr's salt)
   ii. Tetrammine Copper (II) sulphate
4. **Semi-micro Qualitative Analysis :**

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

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

Reference Books :

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

Laboratory Course Organic Chemistry

A) Organic Qualitative Analysis :

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

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

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

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

B) Organic Quantitative Analysis :

i. Estimations (Any Two)

1. Estimation of ester
2. Etimation of acetone
3. Estimation of ibuprofen from ibuprofen tablet

ii. Organic Preparations (Any Three)

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

Reference Books :

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

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SOLAPUR UNIVERSITY, SOLAPUR

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

Faculty of Science

CBCS Pattern Syllabus

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

Mathematics

With effect from June-2017

B.Sc.II - Mathematics :

Preamble :

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

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

Following are the objectives-

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

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

1. Course Structure:

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

2. Distribution of each Theory paper (Marks 100)

University Assessment (UA) : 70 Marks
College Assessment (CA) : 30 Marks

Scheme of College Assessment

1. Unit Test : 15 Marks
2. Home Assignment : 15 Marks

3. Distribution of Practical Marks (200)

Practical examination will be at the end of fourth semester. The candidate has to perform four practicals, one from each group.

A. University Practical Examination (140) Marks: (UA)

a) Problems from paper-V : 30
b) Problems from paper-VI : 30
c) Problems from paper-VII : 30
d) Problems from paper-VIII : 30
e) Journal : 20

B. Practical : Internal Continuous Assessment (60 marks)

Scheme of Marking: **30 Marks:** Internal Test on any four practicals,
30 Marks: Home assignment/oral/Seminars/Conference /Industrial Visit/Group Discussion/Viva, etc.

Semester -III

Paper –V (Differential Calculus)

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

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

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

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

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

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

Reference Books

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

Paper-VI Real Analysis

Unit -1 : Real Numbers **[15]**

1. Introduction
2. Field Structure and Order Structure
3. Bounded and Unbounded Sets: Supremum, Infimum
4 Completeness in the Set of Real Numbers
5. Absolute Value of a Real Number

Unit –2 : Real Sequences **[15]**

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

Unit– 3: Infinite Series **[15]**

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

Recommended Book (Scope of Syllabus):

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

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

Semester – IV

Paper – VII Differential Equations

Unit 1:- Differential Equations of the first order and of degree higher than the first :

Equations that can be resolved into factors of the first degree, Equations solvable for x, Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form. **[10]**

Unit 2 : Linear Equations of the second order :

General form of the second order linear equation, Complete solution when one integral belonging to complementary function is known ,Rules of getting an integral belonging to complementary function , Removal of the First order Derivative. Transformation of the linear equation of second order by Changing the independent variable. **[15]**

Unit 3 : Homogeneous linear equations :

Homogeneous linear equations, Working rule for finding the solution, Equations reducible to Homogeneous form. **[10]**

Unit 4. Simultaneous Equations & Total Differential Equations:

Nature of the solution of simultaneous equations, Rules of solving the Equation, Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness , Method of Solving the Equation. **[10]**

Recommended Book :

Differential Equation :

Ordinary and Partial Differential Equations :by *M.D.Raisinghania,S.Chand Co.Ltd.Ramanagar,New Delhi-110055(Edition2002)*

Unit 1 (Part I) :6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 6.10, 6.11, 6.12.

Unit 2 (Part I) :5.1, 5.2, 5.3, 5.6, 5.7.

Unit 3 (Part II) :4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11.

Unit 4 (Part II) :5.1,5.2, 5.4,5.5,5.6,5.7.

Unit 5 (Part II) :6.2,6.3,6.4,6.5,6.6,6.7.

1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VII Differential Equation , Nirali Prakashan Pune.
2. Differential Equation by Murrey.
3. Differential Equation by Diwan and Agashe
4. Differential Equation by Sharma-Gupta, Krishna Prakashan Media (Pvt.) Ltd, Meerut

Paper –VIII Abstract Algebra

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

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

Unit -2: Equivalence, Congruence, Divisibilty **[10]**

Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.

Unit-3: Groups **[10]**

Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.

Unit-4: Group Homomorphism **[10]**

Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.

Recommended books (Scope of Syllabus):

Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition

Unit – 1 : Chapter-II: Art. 5,6,7,8

Unit – 2 : Chapter-III: Art. 9,10,11,12

Unit – 3 : Chapter-IV : Art. 14,15,16,17,18,19,20 Ch- V :21,22,23

Unit – 4 : Ch- V :21,22,23

Reference Books:

1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VIII: Abstract Algebra -I, Nirali Prakashan Pune.
2. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education 7^{th} edition.
3. University Algebra N.S. Gopalkrishnan.
4. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
5. Fundamentals of Abstract Algebra D. S. Malik & N. Mordeson & M. K. Sen Mc. Graw Hill International Edition.
6. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

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

[NTL – IIA]

Assignment No.1: Tangents and Normals

Assignment No.2: Curvature

Assignment No.3 : Jacobians

Assignment No. 4 : Maxima and Minima

Assignment No. 5 : Real Numbers

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

Assignment No. 7: Real Sequences

Assignment No. 8: Infinite Series

[NTL – IIB]

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

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

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

Assignment No.12: Simultaneous Equations & Total Differential Equations

Assignment No.13: Introduction to Groups

Assignment No.14: Equivalence, Congruence, Divisibilty

Assignment No.15: Groups

Assignment No.16: Group Homomorphism

Equivalent Subject for Old Syllabus

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

Solapur University, Solapur

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

B.Sc. Part- II Physics

Semester III and IV

Choice Based Credit System (CBCS) Pattern

SYLLABUS

w.e.f. A.Y 2017-18

Structure for B. Sc-II

Subject/ Core Course	Name and Type of the Paper		No. of theory Papers / Practicals	Hrs / week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	**B Sc Part - II Semester - III**									
	Core	PHYSICS 1	**Physics Paper V**	3	--	--	100	70	30	3
			Physics Paper VI	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 Part - II Semester - IV**									
	AECC	**Environmental Science**		4			100	70	30	4
	Core	**PHYSICS 1**	**Physics Paper VII**	3	--	--	100	70	30	3
			Physics Paper VIII	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	**PHYSICS 1**	Physics 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**

- Several initiatives have been taken by Solapur University Solapur time to time to upgrade and enhance the academic excellence, examination reforms and developing the skilled minds and skilled hands. The CGPA pattern has been adopted in academic year 2014-15. Now the university is going one step ahead to adopt and implement the Choice Based Credit System (CBCS) semester pattern to both PG and UG. As per initiatives led by University the syllabus of B. Sc. I Physics (CBCS) semester pattern has been finalized and effectively implemented from academic year 2016-17. From this academic year 2017-18 we are implementing B. Sc. II Physics (CBCS) semester pattern effectively.

- The main objective is to create skilled minds and therefore understanding of mathematical knowledge essential for finding solution of various interesting physical phenomenon. It helps in general to improve scientific attitude to solve the research oriented problems of interesting systems

SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II

Core Subject: - Physics

(New CBCS Semester Pattern) syllabus w e f June 2017

1. There will be four theory papers (Paper V and Paper VI for semester III and Paper VII and Paper VIII for semester IV) of 100 marks and 3 credits each. Annual practical examination will be of 200 marks and 8 credits. Total marks for physics as a core subject will be 600 [400 marks (12 credits) for theory and 200 marks (8 credits) for practical). Assessment system for both theory and practical will be of 70 % UA (University Assessment) and 30 % CA (College Assessment).
2. There shall be three periods per paper per week for theory and eight periods per week per practical batch of 16 (Sixteen) students each.
3. Duration of theory examination for each paper of 70 marks will be 2.5 hours each and that for the practical examination will be two days means 4 sessions of 3 hours each.
4. The theory examination of paper V and VI will be held at the end of semester III.
5. The theory examination of paper VII and VII will be held at end of semester IV.
6. The practical examination of the both semester will be held at the end of semester IV. Every student will have to perform four experiments i.e. any one from each group.
7. Report of 30 % CA (15 Marks for internal examination and 15 Marks for assignment of each paper of every semester) of theory and practical (15 Marks for each group at the end of second term of B Sc Part II before commencement of University examination of fourth semester) has to submit by the College in the University office.

Titles of Physics as a core subject with their paper codes

Semester – III

Paper – V (Phy235) - General Physics, Heat and Sound. - 100 (70 % UA + 30 % CA) Marks

Paper –VI (Phy236) - Electronics - 100 (70 % UA + 30 % CA) Marks

Semester – IV

Paper – VII (Phy247) - Optics - 100 (70 % UA + 30 % CA) Marks

Paper – VIII (Phy248) - 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): 15 * 4 = 60 Marks]

Semester III

Physics Paper V (Phy235) - General Physics, Heat and Sound

(100 Marks and 3 Credits)

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 VI (Phy236) - Electronics - (100 Marks and 3 Credits)

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 VII (Phy247) - Optics - (100 Marks and 3 Credits)

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 VIII (Phy248) - Modern physics - (100 Marks and 3 Credits)

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
(200 Marks and 8 Credits)
(With effect from - June 2017)
List of Experiments

Group I (General Physics, Heat and Sound)

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

Group II (Electronics)

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

Group III (Optics)

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

Group IV (Electricity, Magnetism and Modern Physics):

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

NB: At least eight experiments from each group are required to certify the journal. 20 Marks for certified journal should not be given in case of lost certificate. Such students may appear the practical examination of 120 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 CBCS SEMESTER PATTERN (With effect from June – 2017)

Time: - 2 hrs 30 min. **Total marks: -70**

Q.No.1 Choose and write a correct answer from given four alternatives. **(14)**

1) ----------

a)…….b)…….c)……..d)……

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

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

1)
2)
3)
4)
5)
6)
7)
8)

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

1)
2)
3)

B) Solve an example / short answer question **(04)**

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

1)
2)
3)

Q.No.5 Answer any one of the following long answer questions

1) Long answer question / question of derivation (10)
Example on the above long answer question (04)
2) Long answer question / question of derivation (10)
Example on the above long answer question (04)

NB: The following instructions should be strictly followed by the paper setters.

1. Two numerical based sub-questions must be asked in question number one.
2. At least one mathematical example of 2 marks must be asked in question number two.
3. One mathematical example of 5 marks must be asked in both question number 3A.
4. One mathematical example of 7 marks may be asked in question number 4.
5. Weightage for each topic in the question must be given as per periods allotted in syllabus to complete the topic.

Solapur University, Solapur

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

B.Sc. Part- II ZOOLOGY

Semester III and IV

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

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

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

• **Subject:** Zoology

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

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

- To provide an intensive and in depth learning to the students in field of Zoology.
- Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world.
- To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students.
- To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

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

- The successful students will be able to establish research orgnizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc.
- Scientific Research Organizations.
- Universities in India & aboard

Solapur University, Solapur

Faculty of Science

Choice Based Credit System (CBCS)

(w.e.f.2017-18)

Structure for B. Sc-II

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

General Guidelines for Choice Based Credit System (CBCS)

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

1. The University follows Semester system

2. An academic year shall consist of two semesters

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

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

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

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

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

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

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

5. **Scheme of evaluation:**

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

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

Internal Continuous Assessment (30 Marks):

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

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

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

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

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

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

- **ATKT**

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

Solapur University, Solapur

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

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

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

1) ----------

a) b) c) d)

2)

3)

4)

5)

6)

7)

8)

9)

10)

11)

12)

13)

14)

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

i)

ii)

iii)

iv)

v)

vi)

vii)

viii)

xi)

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

i)

ii)

iii)

B) (4)

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

i)

ii)

iii)

iv)

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

i)

ii)

iii)

SOLAPUR UNIVERSITY, SOLAPUR

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

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

SEMESTER-III
THEORY

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

SEMESTER-IV
THEORY

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

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

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

UA- University Assessment
CA- College Assessment

SOLAPUR UNIVERSITY, SOLAPUR
B.Sc.II-Zoology –C B C S PATTERN
w.e.f. 2017-18
Semester-III
Paper-V- Animal Diversity III

Contact Hours:45

Total credits-3

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

List of Recommende Books:

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

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

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

Contact Hours:45
Total credits-3

Unit No.I — **05**

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)

Unit No.II — **03**

Genetics-
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 — **05**

Biological Chemistry- Biomolecules- (Definition, Structure, Types and Biological significance):
i) Carbohydrates
ii) Proteins
iii) Lipids
iv) Nucleic Acids (DNA and RNA)

Unit No.IV — **05**

Economic Zoology-
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 — **02**

4) Dairy Science
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
iii) Housing
iv) Economic importance

05

List of Recommended Book :

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

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

Unit No.I	**Taxonomy:** Salient features and classification of Reptiles, Birds and Mammals up to orders with suitable examples	**05**
Unit No.II	**Type study: 1. Rat** i) Systematic position ii) Habit and Habitats iii) External Morphology iv) Study of following systems: a) Digestive system b) Respiratory system c) Circulatory system d) Excretory system e) Nervous system- Brain and Spinal cord f) Sense Organs – Eye and Ear g) Reproductive systems (Male and Female)	**20**
Unit No.III	**Study of general topics:** A. Mesozoic reptiles: Dinosaurs a) Aquatic : Ichthyosaurs and Plesiosaurs b) Terrestrial : Pterosaurs, Herbivorous (Brontosaurus) and Carnivorous (Tyranosaurus) B. Salient features and affinities: Monotremes and Marsupials C. Dentition in mammals: Introduction, Herbivorous, Carnivorous and Omnivorous with examples	**10**
Unit No.IV	**Poisonous and non-poisonous snakes:** a) Identification features with examples b) Poison apparatus c) Venom : its effects and medicinal uses d) Anti-venom production e) First aid treatment of Snake bite	**05**
Unit No.V	i) Archaeopteryx ii) Aerial adaptations in birds iii) Beak and Leg modification in birds iv) Migration in Birds	**05**

List of Recommended Books:

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

Paper-VIII- Histology and Physiology

Contact Hours:45
Total credits-3

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

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

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

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

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

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

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

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

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

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

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

List of Recommended Books:

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

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

Practical – I — Total credits-2

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

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

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

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

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

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

VII. Study of mitosis using onion root tip

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

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

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

XI. Colorimetric estimation of protein by biuret method

XII. Colorimetric estimation of glucose by suitable method

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

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

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

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

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

Practical –II Total credits-2

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Excursion Tour : Six days tour is recommended

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

OR

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

Note:

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

Equivalence of the new CBCS Course

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

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

PRACTICAL I :

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

Total Marks 70

PRACTICAL II:

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

Total Marks 70