SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science

B.Sc.-I-BOTANY

(Sem-I&II)

Faculty of Science

CHOICE BASED CREDIT SYSTEM (CBCS)

(w.e.f. June, 2016)

- **Title of the Course:** B. Sc.- I
- **Subject :** Botany
- **Choice based credit system :**

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing under graduate degree, the Solapur University is implementing Credit and grading system of Evaluation at Undergraduate level.

Credit is a numerical value that indicates student's work load (Lectures, Lab work, Seminars, Tutorials, Field work, etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into Credits. As per present norms, there are 4 contact hours per paper (subject) per week which works out to be 60 contact hours per paper (subject) per semester.

In Solapur University, for B. Sc.-I, there are 4 optional subject and one (English) compulsory subject. For B. Sc.-I, there are 5 contact hours per paper (subject) per week for optional subject and 4 contact hours for English. Therefore, total contact hours per week are 24. Each subject has 75 contact hours, which are transformed into 5 credits. As there are 4 contact hours per week for English, 4 credits shall be assigned for English subject.

Moreover, the grading system of evaluation is introduced for B. Sc. course, wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 30 marks and University Evaluation for 70 marks. It is 70 + 30 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

- **Conversion of marks into Grades :**

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

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

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

$$\text{SGPA} = \frac{(G1xC1)+ (G2xC2)+ \ldots\ldots\ldots\ldots}{\Sigma Ci}$$

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

2. **Cumulative Grade Point Average (CGPA)**

$$\text{CGPA} = \frac{(G1xC1)+ (G2xC2)+ \ldots\ldots\ldots\ldots}{\Sigma Ci}$$

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

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

Where: Ci: Credits allocated for the i^{th} course

Gi: Grade point scored in i^{th} paper (Subject)

4. Conversion of average grade points into grades:

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

Class	Sem	Subject	No. of Papers/ practicals	Hrs/Week			Paper Marks	UA	CA	Credits	Total
				L	T	P					
B.Sc.I	I	English	English paper I (communication skill)	4	-	-	100	70	30	4	
		Botany	Paper I (**Microbiology and Phycology**)	2.5	-	-	100	70	30	2.5	
			Paper II (**Biomolecules and Cell Biology**)	2.5			100	70	30	2.5	
Grand Total				09			300			09	09 credits

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Credit System Structure for B.Sc.I Semester I

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

UA (University Assessment): University Theory paper shall be of 70 marks for 3.00 hrs duration

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

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Credit System Structure for B.Sc.I Semester II

Class	Sem	Subject	No. of Papers/ practicals	Hrs/Week			Paper Marks			Practical Marks			Credits
				L	T	P		UA	CA		UA	CA	
B.Sc. I	II	English	English paper II (Commu-nication skill)	4	-	-	100	70	30				4
		Botany	Paper III (**Mycology and Phytopatho-logy**)	2.5	--	--	100	70	30		70	30	2.5
			Paper IV (**Archegoniate (Bryophytes, Pteridophytes , Gymnosperm**)	2.5			100	70	30		70	30	2.5
Total				14			300						09
		Practical I		-	-	4		70	30	100			4
Total				14		4	300			200			09
Grand Total										300			13
B.Sc.	Part I									300			13

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

UA (University Assessment): University Theory paper shall be of 70 marks for 3.00 hrs duration

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

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Faculty of Science
Choice Based Credit System (CBCS)
(w.e.f.2016-17)
Structure for B. Sc-I

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.- I Semester - I**									
	Ability Enhancement Course(AECC)	English Paper I (communication skill)		4			100	70	30	4
	Core	Botany	Paper I	2.5	--	--	100	70	30	2.5
		Botany	Paper II	2.5	--	--	100	70	30	2.5
	Core	Subject 2	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
	Core	Subject 3	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
	Core	Subject 4	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
Total				**24**	--	--	**900**	**630**	**270**	**24**
Class :→	**B.Sc.- I Semester - II**									
	Ability Enhancement Course(AECC)	English Paper I (communication skill)		4			100	70	30	4
	Core	Botany	Paper III	2.5	--	--	100	70	30	2.5
		Botany	Paper IV	2.5	--	--	100	70	30	2.5
	Core	Subject 2	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
	Core	Subject 3	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
	Core	Subject 4	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
Total (Theory)				**24**	--	--	**900**	**630**	**270**	**24**
	Core	Botany	Practical I	--	--	4	100	70	30	4
	Core	Subject 2	Practical I	--	--	4	100	70	30	4
	Core	Subject 3	Practical I	--	--	4	100	70	30	4
	Core	Subject 4	Practical I	--	--	4	100	70	30	4
Total (Pract.)						**16**	**400**	**280**	**120**	**16**
Grand Total				**24**		**16**	**1300**	**910**	**390**	**40**

General Guidelines for Choice based credit system

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. B.Sc.Part-I shall consist of two semesters: Semester I and Semester II. In semester –I, there will be two theory paper of 100 marks for each. There shall be four optional science subjects and English paper-I compulsory for every student. Similarly, in semester –II there will be two theory paper of 100 marks for each. There shall be four optional science subjects and English paper-II shall be compulsory for every student. 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 I Sem I&II the internal assessment will be based on Unit tests, Home assignment, viva, practicals etc. as given below. Practical course examination of 100 marks shall be conducted at the end of second semester. The practical examination of 100 marks shall also consist of 70 marks for University practical assessment and 30 marks for college internal assessment. 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.

The details are as follows:

Semester - I:

University Examination (140 Marks): No. of Theory papers (2): Paper – I UA 70 marks, Paper – II UA 70 marks.

Internal Continuous Assessment (30 Marks):

Scheme of Marking: 15 Marks: Internal Test

15 Marks: Home assignment/Tutorials/Seminars/ Group discussion/ Viva/Field visit/Industry visit.

Semester - II:

Theory:

University Examination (140 Marks): No. of Theory papers (2): Paper – III UA 70 marks, Paper – IV UA 70 marks.

Scheme of Marking: 15 Marks: Internal Test

15 Marks: Home assignment/Tutorials/ Seminars/ Group discussion/ Viva/ Field visit/Industry visit.

Practical

University Examination (70 Marks**)**: No of Practicals: 1

Internal Evaluation (30 Marks):

Scheme of Marking: 20 Marks: Internal Test on any two practicals

10 Marks: Lab Journal/viva, attendance, attitude etc.

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 year down 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 5 (five) heads including theory as well as practicals 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.

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Nature of Question Paper for Choice Based Credit System (CBCS)
B. Sc-I
• Faculty of Science •
(w.e.f. June 2016)

Time: - 2 ½ hrs. **Total Marks- 70**

Q1. **Multiple choice questions**. (1x14) = 14

Q2. Answer **<u>any seven</u>** of the followings. (7x2) = 14

i)

ii)

iii)

iv)

v)

vi)

vii)

viii)

ix)

Q3: **A)** Attempt **<u>any two</u>** of the followings. (2x5) =10

i)

ii)

iii)

B) =04

Q4: Attempt **<u>any two</u>** of the followings. (2x7) = 14

i)

ii)

iii)

Q5: Answer **<u>any two</u>** of the followings. (2x7) =14

i)

ii)

iii)

Term: Sem- I separate passing Head: No, Min. Papers: Max. Papers: Max:

The papers under Sem- I are as follows:

Paper I-Microbiology and Phycology **Paper II-Biomolecules and Cell biology** Paper Code: CSSC1BO1 Min: 0 Max 100												
TLM	**Hrs**	**Credits**	**AM**	**Min**	**Max**	**AT**	**Min**	**Max**	**AT**	**Min**	**Max**	**Evaluation**
Lectures	5	5	Theory	--	100	UA	28	70	CA	12	30	Marks system

Term: Sem-II Separate passing Head: No, Min. Papers: Max. Papers: Max:

The papers under Sem-II are as follows:

Paper III – Mycology and Phytopathology **Paper – IV - Archegoniate** Paper Code: CSSC2 BO2 Min: 0 Max 100												
TLM	**Hrs**	**Credits**	**AM**	**Min**	**Max**	**AT**	**Min**	**Max**	**AT**	**Min**	**Max**	**Evaluation**
Lectures	5	5	Theory	--	100	UA	28	70	CA	12	30	Marks system

Sem II Practical Examination

Practicals- Based on Paper No. I to IV. Paper Code: CSSC2 BTPR Min: 0 Max 100												
TLM	**Hrs**	**Credits**	**AM**	**Min**	**Max**	**AT**	**Min**	**Max**	**AT**	**Min**	**Max**	**Evaluation**
Labo-ratory	4	4	Practic al	--	100	UA	28	70	CA	12	30	Marks system

Syllabus of B.Sc. Part – I (Botany) CBCS System

(With effect from June 2016)

Semester – I

Paper – I : Microbiology and Phycology (45 Lectures)

MICROBIOLOGY

Unit 1 : Introduction of Microbiology **(2)**

Unit 2 : **Viruses:** General characters, structure, classification (plant, animal and bacterial viruses) and economic importance of viruses. **(5)**

Unit 3 : **Bacteria:** Characteristics of bacteria, size, forms (Shapes), ultra structure of bacterial cell, Economic importance.(Useful and harmful). **(5)**

Unit 4 : **Mycoplasma:** (Phytoplasma and Spiroplasma) Characters, Structure, classification and significance **(5)**

PHYCOLOGY

Unit 5 : **Algae:** **(8)**

5.1 General characters and classification of algae (As per Smith-1955) up to class.

5.2 Range of thallus organization

5.3 Methods of reproduction

Unit 6 : **Cyanophyta:** **(5)**

6.1 General Characters of Cyanophyta

6.2 Study of ***Nostoc*** – Occurrence, Classification, thallus structure and reproduction

Unit 7 : **Chlorophyta:** **(5)**

7.1 General Characters of Chlorophyta

7.2 Study of ***Spirogyra*** - Occurrence, Classification, thallus structure and reproduction

Unit 8 : **Phaeophyta:** **(5)**

8.1 General Characters of Phaeophyta

8.2 Study of ***Sargassum*** - Occurrence, Classification, thallus structure and reproduction (excluding developmental details of sex organs and sporophyte)

Unit 9 : **Applied Phycology**: **(5)**

9.1 Role of algae in the environment, agriculture, biotechnology and industry.

References Book:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

Paper – II
BIOMOLECULES AND CELL BIOLOGY 45 Lectures

Unit 1 : Biomolecules (18)

1.1 Types and significance of chemical bonds; Structure and properties of water; pH and buffers.

1.2 **Carbohydrates:** Definition, classification, occurrence, General, Physical and chemical properties of monosaccharides (glucose), Oligosaccharides (sucrose) and polysaccharides (starch).

1.3 **Nucleic acids:** Definition, Structure of - RNA; DNA.

Unit-2 : Enzymes (08)

2.1 Definition and physicochemical structure of enzymes.

2.2 Properties of enzymes, Coenzymes, Co-factors and Isoenzymes.

2.3 Mechanism of enzyme action-Lock and key hypothesis.

Unit-3 The cell

3.1 Definition and Ultra Structure of Prokaryotic and Eukaryotic cell. **(04)**

Unit 4 Cell wall (03)

4.1 Origin and Ultra structure of cell wall.

4.2 Chemical composition and functions of cell wall.

Unit 5 Cell membrane

5.1 Ultra structure of cell membrane **(03)**

5.2 Model of cell membrane (Singer – Nicholson's Fluid – Mosaic Model)

5.3 Chemical composition of cell membrane.

Unit 6 Microbodies (06)

6.1 Study of Microbodies with respect to Occurrence, Structure and functions of:

6.2 Peroxisomes

6.3 Glyoxysomes

Unit 7 Cell division (03)

7.1 **Mitosis** – Definition, Various stages of mitosis and its significance.

References Book:

1. Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning.
2. Campbell, PN and Smith A.D. (2011) Biochemistry Illustrated, 4th ed., Published by Churchill Livingstone
3. Tymoczko J. L., Berg J. M. and Stryer L (2012) Biochemistry: A short course, 2nd ed., W. H. Freeman
4. Berg JM, Tymoczko J. L. and Stryer L. (2011) Biochemistry, W. H. Freeman and Company
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
6. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, PearsonEducation Inc. U.S.A. 8th edition.
8. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

SEMESTER – II: PAPER – III

MYCOLOGY AND PHYTOPATHOLOGY (45 Lectures)

Unit 1 : Introduction to true fungi (07)

1.1 Definition, General characteristics; Thallus organization; Cell wall composition; Nutrition; classification of fungi up to class (as per Ainsworth).

Unit-2 : Zygomycotina (05)

2.1 : General characteristics of Zygomycotina, classification, Occurrence Thallus organization and study of life cycle of *Mucor*.

Unit-3 : Ascomycotina (05)

3.1 : General characteristics of Ascomycotina, classification, Occurrence; thallus structure and reproduction in Saccharomyces.

Unit 4 : Oomycetes (05)

4.1 : General characteristic of Oomycetes, Occurrence; Classification, thallus structure and reproduction in *Albugo.*

Unit 5 : Symbiotic associations (05)

5.1 : **Lichens**- General Characters, types (Crustose, Fruticose and foliose), morphology, anatomy and economic importance.

5.2 : **Mycorhiza:** Ectomycorrhiza, Endomycorrhiza and their significance.

Unit 6 : Applied Mycology (06)

6.1 : Role of fungi in biotechnology,

6.2 : Role of fungi in Agriculture-Biofertilizers (Mycorrhizae, Mycopesticides and Mycoweedicides

Unit 7 : Phytopathology (12)

7.1 : Terms and concepts

7.2 : Classification of plant diseases based on symptoms and mode of transmissions

7.3 : Study of plants diseases with respect to symptoms, causal organisms and control measures.

a. Phytoplasma – Little leaf of Brinjal
b. Viral disease –Yellow vein Mosaic of Bhendi,
c. Bacterial disease – *Citrus* canker,
d. Fungal disease – Grain smut of Jowar.

References Book:

1. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.

Paper – IV
ARCHEGONIATE (Bryophytes, Pteridophytes, Gymnosperms)
(45 Lectures)

Unit 1 : Introduction (03)

1.1 Unifying characters of archegoniates and Alternation of generations.

Unit 2 : Bryophytes (14)

2.1 General characteristics and Classification(As per G. M. Smith);

2.2 Study of *Riccia* with respect to occurrence, classification, thallus structure and reproduction (without developmental stages)

2.3 Economic importance

Unit 3 : Pteridophytes (14)

3.1 General characteristics and classification, up to class (as per smith).

3.2 Study of *Selaginella* with respect to occurrence, classification morphology of sporophyte, anatomy (stem) and reproduction (without developmental stages)

3.3 Economic importance

Unit 4 : Gymnosperms (14)

4.1 **:** General characteristics and classification (Sporne),

4.2 **:** Study of *Cycas* with respect to occurrence, classification, morphology, sporophyte and Corolloid roots. Anatomy of Leaf and corolloid root and reproduction-structure of male cone and megasporophyll (without developmental stages)

4.3 **:** Economic importance.

References Book:

1. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
2. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.
4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
5. Vander-Poorteri 2009 Introduction to Bryophytes. COP.

List of Practical (based on paper no I to IV):

1. Study of dissecting and compound microscope
2. Electron micrographs/Models of viruses – T-Phage and TMV (Photographs/models)
3. Gram staining (demonstration)
4. Types of Bacteria to be observed from temporary/permanent slides/photographs.
5. Study of vegetative and reproductive structures o*f Nostoc.*
6. Study of vegetative and reproductive structures of *Spirogyra.*
7. Study of vegetative and reproductive structures of *Sargassum.*
8. Qualitative tests for carbohydrates, reducing sugars and starch (with the help of charts)
9. Study of plant cell structure with the help of epidermal peel mount of Onion/ Rhoeo.
10. Study of enzyme activities of Catalase.
11. Study of enzyme activities of Dehydrogenase.
12. Study different stages of mitosis
13. To study the permeability of plasma membrane.
14. Study of *Mucor.*
15. Study of *Albugo.*
16. Study of Yeast.
17. Study of Lichens.
18. Study of Plant diseases as per theory.
19. Study of Plant diseases as per theory.
20. Study of *Riccia*
21. Study of *Selaginella* - Morphology of sporophyte, anatomy (stem).
22. Study of *Selaginella* - reproduction - structure of strobilus.
23. Study of *Cycas* - Morphology of sporophyte, corolloid root, anatomy (leaf)
24. Study of *Cycas* - reproduction - structure of male cone and megasporophyll.
25. Excursion report and submissions.

SOLAPUR UNIVERSITY, SOLAPUR.

B.Sc. Part-I: Practical Examination in Botany.

March/April 2017.

Batch: **Centre:**

Date: **Total -70 Marks.**

N. B. **1. Draw neat and labeled diagrams wherever necessary.**

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

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

Q-1	Identify and show the important structures observed by you in the given specimen A, B, C and D. leave your preparation for inspection.	20 marks
	(No Written answer)	
Q. 2.	To demonstrate the activities an enzyme catalase or dehydrogenase – E.	7 marks
	(No written answer)	
	OR	
Q. 2	To study the permeability of cell membrane from the given sample – E.	7 marks
Q. 3	Demonstrate the presence of carbohydrate by using any one biochemical test from the given sample	6 marks
Q.4	Prepare the root tip squash and show the different stages of mitosis observed in the specimen – G	7 marks
Q. 5	**Identifications** H- Identify and comment upon the specimen I - Identify and describe the slide/ specimen J - Identify and describe the slide/ specimen K - Identify and comment upon the plant disease L - Identify and comment upon the plant disease	10 marks
Q. 6	a. Excursion report	10 marks
	b. Journal	10 marks

Distribution of marks for practical Examination

S. N.	Name of the topics	Marks
1	Algae	05
2	Fungi	05
3	Bryophytes/	05
4	Pteridophytes	05
5	Gymnosperms	6
6	Biomolecules/ Cell biology	20
7	Pathology	4
8	Tour Report	10
9	Journal	10

Solapur University, Solapur

B.Sc.-I (Chemistry)

CREDIT-GRADING SYSTEM

Syllabus- 2014

SOLAPUR UNIVERSITY, SOLAPUR

SYLLABUS FOR B.Sc – I (CHEMISTRY)

(CREDIT-GRADING SYSTEM)

Structure of the Course:

• Structure of B.Sc. course in faculty of science has total of 06 semesters for 3 years.

• B.Sc.-I comprises of total two semesters. Each semester will have one theory paper of 70 marks for university external examination and 30 marks for internal examination.

• At the end of academic yeari.e. semester II the practical examination will be conducted.

The Weightage of practical is of 70 marks for university external practical examination and 30 marks for internal practical examination.

Semester	Paper No.	Title of Paper	Total Lectures	Total Marks			Total Credit
				Univ. Exam	Internal Exam	Total	
Semester I	I	Physical and Inorganic Chemistry	75	70	30	100	05
Semester II	II	Organic and Analytical Chemistry	75	70	30	100	05
Practical	I	Chemistry		70	30	100	04

- Each theory paper has two sections of 35 marks for university external examination.
  Paper –I: Section –I: Physical chemistry of 35 marks with 2.5 credits.
  Section –II: Inorganic Chemistry of 35 marks with 2.5 credits.
  Paper –II: Section –I: Organic chemistry of 35 marks with 2.5 credits.
  Section –II: Analytical Chemistry of 35 marks with 2.5 credits
- Continuous Internal Assessment for chemistry:
  1) Each theory paper has 30 marks for internal examination. There will be 20 marks unit test and 10 marks home assignment.
  2) Practical paper has 30 marks for internal examination. There will be two practicals of 15 marks.
  3) Practical paper has 70 marks for external university practical examination. Duration of practical examination is one day. There will be three practicals, one from each physical, inorganic and organic practical work. Out of 70 marks for external university practical examination, the mark distribution is as follows.
     Q. 1 Physical Chemistry experiment : 20 marks
     Q. 2 Inorganic Chemistry experiment: 20 marks
     Q. 3 Organic Chemistry experiment : 20 marks
     Q. 4 Oral : 05 marks
     Q. 5 Journal : 05 marks

     Total marks : 70 marks

SOLAPUR UNIVERSITY, SOLAPUR

SYLLABUS FOR B.Sc – I (CHEMISTRY)

(CREDIT-GRADING SYSTEM)

SEMESTER-I

PAPER –I (Physical and Inorganic Chemistry)

(Total Credits: 5; Contact hrs: 75)

SECTION- I: Physical Chemistry

UNIT –I: Chemical Kinetics and Mathematical concepts Contact hrs: 22.5

Credit- 1.5

A. Chemical Kinetics (Contact hrs: 16.5)

1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst.

1.2 Order and Molecularity of reaction.

1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: Decomposition of N_2O_5

1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction.

Examples : i) Reaction between $K_2S_2O_8$ and KI .

1.5 Pseudounimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid.

1.6 Methods to determine the order of reaction:

a) Integration method, b) Graphical method

c) Half change method, d) Ostwald's isolation method

(Numerical Problems Expected)

B. Mathematical Concepts (Contact hrs: 06)

2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straightline and intercept, plotting of graph based on experimental data.

2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.

2.3 Integration : Rules of Integration (without proof) pertaining to algebric and exponential functions. Example related to chemistry.

(Numerical Problems not expected)

UNIT – II: Thermodynamics and gaseous State Contact Hrs: 15

Credit- 1

A. Thermodynamics: (Contact hrs: 05)

3.1 Spontaneous & non spontaneous processes, Second law of thermodynamics andits different statements.

3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.

(Numerical Problems Expected)

B. Gaseous State: (Contact hrs:10)

4.1 a) Ideal and Non ideal gases, b) Deviation from ideal behaviour. (Only Boyle's law)

c) Causes of deviation, van der Waal's equation, explanation of real gas behavior by van der Waal's equation.

4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.

4.3 Liquification of gases, Joule-Thomson effect.

(Numerical Problems expected)

Reference Books:

1) Mathematical preparation of Physical Chemistry : F. Daniel Mc-Graw Hill Book Com.
2) Elements of Physical Chemistry : S. Glasstone and D. Lewis (D. Van Nostrand Co. Inc)
3) Physical Chemistry : W. J. Moore (Orient Longman)
4) Principles of Physical Chemistry :MaronPrutton
5) University Chemistry : B. H. Mahan (Addision - Weseley Publ. Co.)
6) Chemistry Principle &Applications : P.W. Atkins, M. J. Clugsto, M.J. Fiazer, R. A. Y. Jone (Longman)
7) Physical Chemistry : G. M. Barrow (Tata Mc-Graw Hill)
8) Essentials of Physical Chemistry : B. S. Bahl& G.D. Tuli (S. Chand)
9) Physical Chemistry : A. J. Mee.
10) Physical Chemistry : Daniels - Alberty.
11) Principles of Physical Chemistry :Puri - Sharma (S. Nagin)
12) Text Book of Physical Chemistry :SoniDharmarha
13) University General Chemistry : CNR. Rao (McMillan)
14) Chemistry :Sienko - Plane (Recent Edn,.)
15) Physical Chemistry Through problems :Dogra and Dogra (Wiley Eastern Ltd.,)
16) Physical Chemistry : S. Glasstone.
17) Basic Chemical Thermodynamics : V. V. Rao.

SECTION-II: Inorganic Chemistry

UNIT – III: Atomic Structure, periodic properties and Ionic Solids **Contact hrs: 17.5**

Credit- 1.17

A. Atomic Structure and periodic properties (Contact hrs:8.5)

1.1 Atomic Structure

a) Shapes of s, p, d orbitals.
b) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity
c) General electronic configuration of s and p block elements.

1.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionization energy, Electron affinity Electronegativity, Reactivity,Melting and Boiling point

B. Ionic Solids (Contact hrs:09)

2.1 Ionic Bonding

a) Formation of ionic bond, Energetics of ionic bonding :Ionisation potential, Electron affinity and Lattice energy.
b) Characteristics of ionic compounds.
c) Born-Haber Cycle for Alkali metal halide (NaCl).
(Numerical Problems are expected)
d) Fajan's rules.

2.2 Radius ratio and crystal structure.

a) Definition: Radius ratio (r+ / r-), Coordination number, Stoichiometry and unit cell.
b) Concept and calculation of radius ratio (r+ / r-) for ionic solid withoctahedral geometry.
c) Radius ratio effect on geometry.
d) Crystal structure of NaCl and CsCl w.r.t. unit cell, radius ratio, coordinationnumber and stoichiometry.

UNIT – IV: Theories of Covalent BondingContact hours- 20
Credit- 1.33

A. Valence Bond Theory(VBT) Approach (Contact hrs:10)

3.1 Valence Bond Theory: Heitler – London Theory and Pauling Slater Theory
3.2 Limitations of VBT
3.3 Need of Hybridisation
3.4 Types of hybridization and shapes of simple inorganic molecules: $BeCl_2$, BF_3, $SiCl_4$, PCl_5, SF_6, IF_7.
3.5Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O, ClF_3

B. Molecular Orbital Theory(MOT) Approach (Contact hrs:10)

4.1 Atomic and Molecular orbitals.
4.2 L.C.A.O. Principle
4.3 Bonding, Antibonding and Nonbonding Molecular orbitals.
4.4Conditions for successful overlap
4.5 Different types of overlap (s-s, s-px, px - px and py- py or pz- pz)
4.6Energy level sequence of molecular orbitals for n = 1 and n = 2
4.7 M. O. Diagrams for: a) Mononuclear diatomic molecule. H_2, Li_2, Be_2, C_2, N_2 and O_2
b) Heteronuclear diatomic molecules CO and NO w.r.t. bond order stabilityand magnetic properties.

Reference Books:

1) Advanced Inorganic Chemistry - Cotton and Wilkinson
2) Inorganic Chemistry - J. E. Huheey
3) Concepts and models of Inorganic Chemistry - Douglas & Mc-Daniel
4) Principles of Inorganic Chemistry - Puri, Sharma
5) New Concise Inorganic Chemistry - (ELBS) - J. D. Lee
6) Text book of Inorganic Chemistry - P. L. Soni
7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu
8) Theoretical Principles of Inorganic Chemistry - G. S. Manku
9) Principles of Inorganic Chemistry - Puri, Sharma &Kalia

SEMESTER-II
PAPER II: (Organic and Analytical Chemistry)
(Total Credits: 5; Contact hrs: 75)
SECTION- I: Organic Chemistry

UNIT: - I: **Contact hours 22.5**
Credit- 1.5

A. Fundamentals of organic reaction mechanism (Contact hrs:06)

1.1 Meaning of reaction mechanism.
1.2 Curved arrow notation, Half headed and double headed arrows.
1.3 Types of bond breaking :Homolytic and Heterolytic.
1.4 Types of reagents : Electrophilic and Nucleophilic.
1.5 Types and sub-types of following organic reactions with definition and atleast one example of each. a) Substitution b) Addition c) Elimination d) Rearrangement.
(Mechanism is not expected)
1.6 Reactive Intermediates with examples carbocations, carbanions (formation,structure, stability and reactions are expected). Carbon free radicals, carbenes,arenes, nitrenes
(Definition with example only)

B. Stereochemistry of organic compounds (Contact hrs:06)

2.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerismand Conformational isomerism.
2.2 Chiral center[Explanation with lactic acid]
2.3 Elements of symmetry
2.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxybutanic acid
2.5 Enantiomers and diastereoisomers.
2.6 Racemic modification.
2.7 Geometrical isomerism-cause of geometrical isomerism.
2.8 Geometrical isomerism w.r.t. C = C
Geometrical isomerismin maleic acid and fumaric acid.

C. Alkanes and Cycloalkanes (Contact hrs:4.5)

3.1 Alkanes : Methods of formation with special reference to Wurtz reaction, Kolbereaction, Corey-House reaction and decarboxylation of carboxylic acid.
3.2 Mechanism of free radical halogenation of alkanes.
3.3 Cycloalkanes - Nomenclature methods of formation
(a) Internal Wurtz reaction
(b) Distillation of calcium or barium salt of dicarboxylic acid.
3.4 Chemical properties of cyclopropane
(i) Free radical substitution of chlorine inpresence of light.
(ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni

D. Aromaticity and Benzene (Contact hrs:06)

4.1 Meaning of the terms - Aromatic, non-aromatic, antiaromaticand psuedoaromatic compounds.
4.2 a) Kekule structure of benzene
b) Resonance structures of benzene.
c) Molecular orbital picture of benzene.
d) Representation of benzene ring.
4.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons,

coplanarity and Huckel's (4n + 2) π rule. Applications of Huckel's rule tonapthalene, pyrroleand pyridine.
4.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration,sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation.

UNIT: - II: **Contact hours 15**
Credit- 1

A. Alkenes, Dienes and Alkynes (Contact hrs:08)

5.1 Nomenclature of alkenes.
5.2 Methods of formation of alkenes with mechanism
i) By dehydration of lower alcohols.
ii) By dehydrohalogenation of lower alkyl halides.
5.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation,Oxidation with $KMnO_4$, Polymerisation of alkenes - ethylene and propylene
5.4 Nomenclature and classification of dienes.
5.5 Isolated, Conjugated and cumulated dienes.
5.6 Butadiene - Methods of formation, polymerisation, 1 : 2 & 1 : 4 additionsand Diels-Alder reaction.
5.7 Alkynes - Nomenclature, Acidity of alkynes.
5.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.

B. Structure and Bonding (Contact hrs:07)

6.1 Hybridization: sp^3, $sp^2$and sp w.r.t. methane, ethylene and acetylene respectively.
6.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : sp^3, $sp^2$and sp hybridization
6.3 Resonance effect with respect to phenol, and nitrobenzene.
6.4 Hyperconjugation w.r.t. toluene.
6.5 Inductive effect w.r.t. + I and - I .
6.6 Steric effect w.r.t. mesitoic acid.

Reference Books

1) Organic Chemistry : Hendrickson, Cram, Hammond.
2) Organic Chemistry : Morrison & Boyd
3) Organic Chemistry : Volume I & II I.L. Finar
4) Organic Chemistry : Pine
5) Advanced Organic Chemistry :SachinkumarGhosh
6) Advanced Organic Chemistry : B.S. Bahl and ArunBahl
7) A Guide book to Mechanism in organic Chemistry : Peter Sykes
8) Stereochemistry of Organic Chemistry :Kalsi,
9) Stereochemistry of Carbon Compounds :Eliel
10) Text book of Organic Chemistry : P. L. Sony
11) Practical Organic Chemistry : By A. I. Vogel
12) Advanced Organic Chemistry - Reactions, Mechanism &Structure : Jerry March
13) Organic Chemistry : M.R. Jain
14) Organic Chemistry : J. M. Shaigel

SECTION- II: Analytical Chemistry

UNIT – III: **Contact hrs: 22.5**
Credit- 1.5

A. Physical properties of liquids (Contact hrs:07)

1.1 Introduction, additive & constitutive properties.
1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer.
1.3 Surface tension:- Determination of surface tension by Drop –Weight method
1.4 Parachor:-Macleod equation & its modification by Sugden, applications of parachorin the determination of molecular structures as benzene, NO_2 group (Numerical problems not expected).

B. Qualitative and Quantitative elemental analysis Contact hrs:08

2.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur
2.2 Quantitative analysis of -
i) Carbon & hydrogen by Combustion method
ii) Nitrogen by Kjeldahl's method
iii) Halogen and by Carius method.
2.3 Determination of molecular weight of an acid by titration method.
2.4 Empirical formula and molecular formula determination. (Numerical Problems Expected)

C. Chemistry in day-to-day life Contact hrs:7.5

3.1 Types of water, desalination, Fresh water, Dissolved Oxygen and water quality.
3.2 Milk: Definition, Chemical composition of milk of different species such as cow, buffalo and goat.
3.3 Adulteration in milk like Sugar, Urea, Starch.
3.4 Essential nutrients for plants, Classification, Major, minor & trace their sources and forms.
3.5 Importance of Inorganic Compounds as Medicine- Antacid products Na_2CO_3, $Al(OH)_3$, $AlPO_4$, $Mg(OH)_2$, Cis-Platin

UNIT – IV: **Contact Hrs: 15**
Credit- 1

A. Distribution Law Contact hrs:05

4.1 Nernst distribution law, its limitations & modification with reference to association & dissociation of solute in one of the solvent.
4.2 Applications of distribution law in:
a) Process of extraction (derivation expected)
b) Determination of solubility
c) Distribution Indicators
d) Determination of molecular weight
(Numerical problems expected)

B. Metallurgy Contact hrs:06

5.1 Introduction: - Terms used in Metallurgy, Metallurgy, Mineral, Ore, Gangue, Flux, Slag
5.2 Occurrence of metals: Types of Ores.
5.3 Steps Involved in Metallurgical Processes:
A) Concentration of Ores:
i) Physical Methods: a) Gravity separation method
b) Magneticseparation method
c) Froth floatation method.

ii) Chemical Methods: a) Calcination and b) Roasting

B) Reduction: Mention various methods of reduction. Extraction of Iron by blast furnace.

C. Environmental Chemistry **Contact hrs:04**

6.1 Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD)

6.2 Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution.

6.3 Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.

Reference Books

1) Chemistry - Central Science, Brown, Lemay, Bursten 8th Edition.
2) Outline of Dairy Technology - Sukumar De Oxford university Press.
3) Introduction to Agronomy & soil water management - V. G. Vaidya, N.R.Sahastrabudhye.
4) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977
5) Inorganic Medicinal & Pharmaceutical Chemistry- Block, Roche, Soine –Wilson, Varghese Publishing House.
6) Environmental Chemistry - A.K. De
7) Environmental pollution analysis - S.M. Khopkar
8) Organic Chemistry : Hendrickson, Cram, Hammond.
9) Organic Chemistry : Morrison & Boyd
10) Organic Chemistry : Volume I & II I.L. Finar
11) Organic Chemistry : Pine
12) Advanced Organic Chemistry :SachinkumarGhosh
13) Advanced Organic Chemistry : B.S. Bahl and ArunBahl
14) A Guide book to Mechanism in organic Chemistry : Peter Sykes
15) Stereochemistry of Organic Chemistry :Kalsi,
16) Stereochemistry of Carbon Compounds :Eliel
17) Text book of Organic Chemistry : P. L. Sony
18) Practical Organic Chemistry : By A. I. Vogel
19) Advanced Organic Chemistry - Reactions, Mechanism &Structure : Jerry March
20) Organic Chemistry : M.R. Jain
21) Organic Chemistry : J. M. Shaigel
22) Industrial Chemistry : Rogers
23) Industrial Chemistry :R.K.Das

B.Sc. – I (Chemistry Practical Course)

Credits: 4

Marks: 100(70+30)

N.B. i) Use of Digital balance is allowed.
ii) Use S.I. Units Wherever Necessary.

A) Physical Chemistry.

1) Determination of viscosity of given liquids A and B. (Density data of liquids, viscosityof water to be given.) [Any two liquids from, Acetone, CCl_4, Ethyl alcohol, Ethylene glycol and n-propyl alcohol]
2) Determination of equivalent weight of Mgby Eudiometer.
3) Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.
4) Study of specific reaction rate of hydrolysis of methyl acetate in presence of H_2SO_4
5) Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)
6) Determination of heat of ionization of weak acid.

Reference Books :

1) Practical book of Physical Chemistry :Nadkarni, Kothari &Lawande.
2) Experimental Physical Chemistry : A. Findlay.
3) Systematic Experimental Physical Chemistry : S.W. Rajbhoj, Chondhekar (Anjali Pub.)
4) Experiments in Physical Chemistry :R.C.Das and B. Behra. (Tata Mc. Graw Hill)
5) Advanced Practical Physical Chemistry : J. B. Yadav (Goel Publishing House)
6) Practical Physical Chemistry : B. D. Khosala (R. Chand & Sons.)
7) Experiments in Chemistry : D. V. Jagirdar

B) Inorganic Chemistry

1) Inorganic Quantitative Analysis :

1) Study of analytical balance and calibration of fractional weights.
2) Volumetric Analysis :
i) To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and Kg/dm^3
ii)To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm^3(Use internal indicator)
iii) To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.

2) Qualitative Analysis:

1) Spot Tests: Detection of following cations using spot tests : Cu^{2+}, Co^{2+}, Ni^{2+}, Fe^{3+}, Zn^{2+}, Mg^{2+}, Al^{3+}, Pb^{2+}.
2) Chromatography :Separation and identification of cations by Paper Chromatographic technique from the following mixtures :
a) Ni^{2+}+ Cu^{2+}
b) Ni^{2+}+Co^{2+}
c) Cu^{2+}+ Co^{2+}

Reference Books :

1) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
2) Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
3) Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.

C) Organic Chemistry

1) Estimations :

i) Estimation of aniline and ii) Estimation of acetamide

2) Organic Qualitative Analysis.

Identification of at least five organic compounds with reactions including one from acids, one form phenols, one from bases and two from neutrals from the list of the compounds given below-

i) Acids : Oxalic acid, Benzoic acid and Cinnamic acid

ii) Phenols : β - Napthol, Resorcinol.

iii) Bases : Aniline, p - toluidine.

iv) Neutrals : Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-dinitrobenzene, Thiourea.

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

1) Preliminary tests and physical examination.
2) Determination of physical constant.
3) Detection of Elements.
4) Determination of functional group.
5) A search into the literature.
6) Special Test.
7) Summary.
8) Result.

3) Organic Preparation: (Any one)

i) Preparation of benzoic acid from benzamide.
ii) Preparation of succinimide form succinic acid.
(Wt. of crude product is expected. M.P. of the recrystallized product is not expected.)

Reference Books:

1) Vogel's Text Book of Quantitative Chemical Analysis, (Longman) ELBS. Edition
2) Vogel's Text Book of Qualitative Chemical Analysis, (Longman) ELBS. Edition
3) Hand book of Organic Qualitative Analysis : Clarke
4) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia, SunitaDhingra, University Press. Distributor - Orient Longman Ltd.,
5) Comprehensive Practical Organic Chemistry preperation and Quantitative Analysis. : V.K. Ahluwalia, RenuAgarwal, University Press. Distributor - Orient Longman Ltd.,
6) A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni, DastaneRamchandra and Co. Pune

Solapur University, Solapur

Nature of Question Paper for Credit-Grading System Semester Pattern

• Faculty of Science •

(w.e.f. June 2014)

Time: - 3.00 hrs. Total Marks- 70

Instructions:

1. Section **I and II** are compulsory
2. Answers to the **two sections** should be written in **separate** answer books
3. All questions are compulsory.
4. Draw **neat diagrams** and give **equations** wherever necessary.
5. Figures to the **right** indicate **full marks**.
6. Use of logarithmic table and calculator is allowed.
   (At.Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

Section - I

Q. No.1) Multiple choice questions (5)

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

a) b) c) d)

2)

3)

4)

5)

Q.No.2) Answer any Five of the following (10)

i)

ii)

iii)

iv)

v)

vi)

vii)

Q.No.3 A) Write short notes on any Two of the following (10)

i)

ii)

iii)

B) Answer any One of the following (10)

i)

ii)

Section - II

Q. No.4) Multiple choice questions. (5)

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

a) b) c) d)

2)

3)

4)

5)

Q.No.5) Answer any Five of the following (10)

i)

ii)

iii)

iv)

v)

vi)

vii)

Q.No.6 A) Write short notes on any Two of the following (10)

i)

ii)

iii)

B) Answer any One of the following (10)

i)

ii)

Solapur University, Solapur

Semester Pattern

Choice Based Credit System (CBCS)Syllabus

B.Sc.I

Mathematics

(w.e.f. June 2016)

For undergraduate course as per the sanctioned workload of Thirty Six (36) Periods.

Class	Periods / Week	Marks
B.Sc.- I	9	500
B.Sc.- II	9	600
B.Sc.-III	18	1200

Details of Re-Draft Syllabus of B. Sc. Part-I (MATHEMATICS)
Semester-wise pattern(Commencing from JUN – 2016)

B.Sc.I (Mathematics) (Honours)semester-wise Choice Based Credit System [CBCS] pattern to be implemented from June 2016. This syllabus of Mathematics carries 500 marks. In semester –I Internal examination (college examination) of 30 marks and external examination (university examination) of 70 marks [Total 70 +30 =100] for Theory paper –I, paper-II, also in semester – II for Theory paper –III, Paper-IV and at the end of second term for **Numerical Technique Laboratory** [**NTL**] [**NTL** – I] will be held. The distribution of marks is as follows.

Semester -I

(1) Paper-I ALGEBRA (Marks 70+30 = 100)
(2) Paper-II CALCULUS (Marks 70+30 = 100)

Semester -II

(3) Paper –III GEOMETRY (Marks 70+30 = 100)
(4) Paper –IV DIFFERENTIAL EQUATIONS (Marks 70+30 = 100)

(5) Numerical Technique Laboratory [**NTL**] [**NTL** – I]**(Marks 70 +30 =100)**

Internal exam of 30 marks and annual examination of 70 marks on all the above four papers.

Note:-

(1) Total teaching periods for Paper –I / Paper –II and for Paper –III / Paper –IV are five(5) per week for each semester.

(2) Total teaching periods for NTL –I are four(4) per week for whole class as one batch.

Duration of Annual Examination :

(i) For Paper –I /II (Two & half hours) in semester -I
(ii) For Paper –III/IV (Two and half hours) in semester -II
(ii) For NTL –I (Two and half hours for a batch of 20 students) annually.

Semester -I

Paper –I (Algebra) 40 Periods

Unit 1 : Matrices : Symmetric and Skew symmetric, Elementary transformations, Rank of a Matrix(Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. **[10]**

Unit 2 :Linear Equations : Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Eigen values and eigen vectors. [**10]**

Unit 3 : Complex Number : Modulus and Argument of a Complex Number, DeMoivre's theorem and its applications, Roots of Unity, Roots of Complex Numbers. **[10]**

Unit 4 : Transcendental Functions : Circular Functions and their inverses and Hyperbolic function of a complex variable with their inverses. **[10]**

Paper –II (Calculus) 40 Periods

Unit 1 : Differentiation: Indeterminate forms and L' Hospital's Rule, Successive differentiations, n^{th} derivatives of standard functions, Leibnitz rule.Taylor's theorem and Maclaurin's Theorem (Only Statements). Series expansions of e^x , cos x, sin x, $(1+x)^n$, log(1+x) **[10]**

Unit 2: Function of two variables : Limit and Continuity of functions of two variables, Partial derivative, partial derivative of higher orders, Homogeneous functions, Euler's theorem on Homogeneous functions. **[10]**

Unit 3: Reduction formulae :

$\int_0^{\pi/2} sin^n x\, dx$ $\int_0^{\pi/2} cos^n x\, dx$ $\int_0^{\pi/2} sin^n x\, cos^m x\, dx$

(Note that reductions to these forms are not expected) **[10]**

Unit 4 :Vector Calculus : Scalar point function , Vector point function , Directional derivative, Gradient , divergence and Curl and its properties. **[10]**

Semester -II

Paper –III (Geometry) 40 Periods

Unit 1 :-Change of Axis: Translations, Rotations, Invariants, Identifications of conics from general form of second degree equations,Polar Coordinates, Conversion formulae. **[10]**

Unit 2 :-Plane : General equation of plane, Normal equation, Intercept form Angle between two planes, Plane through three points, Plane through a given point, Sides of a plane, Distance of a point from a plane, Family of planes. **[15]**

Unit 3 : Sphere: Centre radius form, General form , Diameter form, Equation of Tangent Plane and condition for tangency, Family of spheres $S+\lambda S'=0$, $S+\lambda P=0$. **[15]**

Paper-IV (Differential Equation) 40 periods

Unit 1:- Differential Equations of first order and first degree :[Part-I]

Variables separable, Homogeneous, non- homogeneous differential equations. [**10]**

Unit 2 :- Differential Equations of first order and first degree :[Part-II]

Exact differential equations. Necessary and sufficient condition for exactness, Integrating factor with four rules, Linear differential equations of the form: $dy/dx+py=Q$; Bernoulli'sEquation $dy/dx+Py=Qy^n$. [**10]**

Unit 3 :- Linear Differential Equations With Constant Coefficients :[Part-I]
Complementary function and particular integral, General solution of f(D) y=X, Solution of f(D)y=0 for non-repeated , repeated, real and complex root. **[10]**

Unit 4 :- Linear Differential Equations With Constant Coefficients : [Part-II]
Solution of f(D)y=X , where X is of the form
e^{ax}, sin(ax), cos(ax), x^m, $e^{ax}V$, xV **[10]**

Numerical Technique Laboratory[NTL –I]

4 Periods per week.

Assignment –1 : Inverse of Matrix by Cayley-Hamilton Method.
Assignment –2 : Solution of system of Linear Homogeneous Equation
Assignment –3 : Solution of system of Linear non-homogeneous Equation.
Assignment –4 : n th roots of a complex number.
Assignment –5: Leibnitz Rule
Assignment –6 : Reduction formulae
Assignment– 7: Partial differentiation
Assignment –8 : Numerical examples on gradient, divergence and curl.
Assignment – 9 : Change of axis and invariants.
Assignment –10 : Conversion between Polar and Cartesian of points and equations
Assignment –11 : Family of Planes.
Assignment –12 : Family of Spheres.
Assignment – 13 : Linear differential equations.
Assignment –14 : Particular Integrals of $\mathbf{e^{ax}}$ **and** $\mathbf{x^m}$.
Assignment –15 : Particular Integrals of **sin(ax) and cos(ax).**
Assignment –16 : Particular Integrals of $\mathbf{e^{ax}V}$, **xV**.

Nature of question paper
Theory Papers
(Paper- I, II, III and IV)

Each Paper is of **Marks 70** each. Distribution is as follows.All five questions are compulsory and each of marks **Ten (14).** **[Total 70]**

Q. No. 1: Total 14 Multiple Choice Questions each of mark 1. **[14]**
Q. No. 2: Attempt any SEVEN Questions out of EIGHT (each of 2 marks) **[14]**
Q. No. 3: A) Attempt any TWO out of THREE (each of marks 5)
B) One compulsory question of marks 4 **[14]**
Q. No. 4: Attempt any TWO out of THREE each of Marks 7 **[14]**
Q. No. 5: Attempt any ONE out of TWO each of marks 14 **[14]**
OR
Attempt any TWO out of THREE each of Marks 5 **[14]**

Numerical Laboratory Technique- I [NTL- I]

There is ONE NTL-I of 2.5 hours for a batch of 20 students at the end of the year. (similar to Practicle)

Numerical Laboratory Technique- I [NTL- I]

There is ONE NTL of 2.5 hours each for a batch of 20 students at the end of the year.

Numerical Laboratory Technique- I [NTL- I] Marks 70

Q.1 Attempt any SIX out of EIGHT 10 marks each (60marks)

Journal (10 marks)

Total (70 marks)

References

Paper -I : Algebra **Paper -II : Calculus**

Paper – III : Geometry **Paper -IV : Differential Equation**

Numerical Technique Laboratory – I [NTL – I]

1. **ALGEBRA , B. Sc. – I (Semester –I) MATHEMATICS- Paper-I by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **July 2014**) **ISBN 978-93-5164-169-8.**
2. **CALCULUS, B. Sc. – I (Semester –I) MATHEMATICS- Paper-II by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **July 2014**) **ISBN 978-93-5164-162-9.**
3. **GEOMETRY, B. Sc. – I (Semester –II) MATHEMATICS- Paper-III by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **November 2014**) **ISBN 978-93-5164-339-5.**
4. **DIFFERENTIAL EQUATION , B. Sc. – I (Semester –II) MATHEMATICS- Paper-IV by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **December 2014**) **ISBN 978-93-5164-445-3.**
5. **Algebra and Geometry by R. B. Kulkarni , J. D. Yadav , S. J. Alandkar, N. I. Dhanshetti. (SUMS Publication) B.Sc.-I Paper-I**
6. **Algebra and Geometry (B.Sc.-I Paper-I) by L. G. Kulkarni , Dr. B. P. Jadhav ,Dr. Mrs. P. D. Patwardhan , Dr. M. K. Kubade. [Phadke Prakashan]**
7. **Text Books of Matrices by Shanti Narayan.**
8. **A Text Book of Analytical Geometry of Two dimensions, by P. K. Jain and Khalil Ahmid , Wiley Eartern Ltd. 1994.**
9. **Calculus and Differential Equations (B.Sc. –I ,Paper –II)**
   By H. T. Dinde , A. D. Lokhande , P. D. Sutar , U. H. Naik.(SUMS Pub.)
10. **Calculus and Differential Equations (B. Sc. I , Paper- II) by L. G. Kulkarni ,Dr. B. P. Jadhav , Dr. Mrs P. D. Patwardhan , Dr. M. K. Kubade [Phadke Prakashan]**
11. **Differential Calculus by Shanti Narayan**
12. **A text book of Vector Calculus , by Shanti Narayan.**
13. **Differential equations, by G. S. Diwan, D. S. Agashe. Popular Prakashn , Bombay.**
14. **Introductory course in Differential Equation by D. A. Murray Orient Longman**

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SOLAPUR UNIVERSITY, SOLAPUR
Choice Based Credit System Syllabus
B.Sc. Part I Physics (w. e. f. June 2016)

N. B.:-

i) There will be two theory papers of 100 (70 % UA & 30 & CA) marks for each semester. Practical examination at the end of second semester will be of 100 (70 % UA & 30 & CA)marks. Total marks for physics subject will be 500 (70 % UA & 30 & CA) and 5 + 5 + 4 = 14 Credits.

ii) There shall be 2.5 periods (2.5 Credits) per paper i.e. 5 periods per week for theory and 4 periods (4 Credits) per week for each batch of 20 students for practical.

iii) The duration of theory examination for each paper will be 3 hours each and that for practical will be 6 Hours. There will be two sessions for annual practical examination each of 3 hours.

iv) Examination of Physics theory Paper-I & II will be held at end the of first Semester.

v) Examination of Physics theory Paper-III & IV will be held at the end of second Semester.

vi) Practical examination of both semesters will be held at the end of semester II. Every student will have to perform two experiments (one experiment from each Group).

Semester - I

(Theory Course)

Titles of theory papers

Core Subject: Physics Paper I – Mechanics and properties of matter.

100 (70 % UA and 30 % CA) Marks and **(2.5 Credits)**

Core Subject: Physics Paper II – Optics and Laser.

100 (70 % UA and 30 % CA) Marks and **(2.5 Credits)**

Semester – II

(Theory Course)

Titles of theory papers

Core Subject: Physics Paper III – Heat and Thermodynamics.

100 (70 % UA and 30 % CA) Marks and **(2.5 Credits)**

Core Subject: Physics Paper IV – Electricity, Magnetism and Basic Electronics.

100 (70 % UA and 30 % CA) Marks and **(2.5 Credits)**

Practical Course of Semester – I & II

(Practical Course examination at the end of second semester)

Titles of Practical Groups

Core Subject Physics Practical: Group I – General Physics and Heat

50 (35 UA and 15 CA) Marks and **(2 Credits)**

Core Subject Physics Practical: Group II – Electricity, electronics, and optics

50 (35 UA and 15 CA) Marks and **(2 Credits)**

ANNUAL PRACTICAL EXAMINATION AT THE END OF 2nd SEMESTER OF 100 Marks (UA – 70 Marks + CA – 30 Marks)

Group (I & II) experiments UA (25 * 2) + CA (15 * 2) = 50 + 30 = 80 Marks

Scale down of 25 Marks for UA per Group: As per given in the practical slips
Scale down of 15 Marks for CA per Group: -
(10 Marks for experimental performance, 03 Marks for attendance and 02 Marks for Oral)

Scale down of UA 20 marks of practical Assessment part during University Practical examination by external examiner only.

1. Journal …..…….……20 Marks

Certified Journal…….12 Marks

Neatness & Punctuality (4+4)...…….....08 Marks

Any 10 experiments from each group are required to certify the Journal. 20 Marks for certified journal should not be given in case of loss certificate. Student may appear practical examination for 25+25=50 marks with prior permission of his/her Principal. External Examiner will allow him/her only after submission of permission letter of their Head of Physics Department / Principal.

NATURE OF QUESTION PAPER FOR PHYSICS PAPER I & II

[COLLEGE ASSESMENT (CA) OF 30 MARKS]

(Internal examination taken by the college as per its own time table)

Time: - 1 hrs **Total marks: - 20**

Q.No.1) Select the correct answer from the given alternatives. (05)

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

a) ……b)……..c)…….d)……

2) ……. ..Do …….

3) …… Do …….

4) …… Do …….

5) …… Do …….

Q.No.2) Answer any one of the following (05)

1)

2)

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

1)

2)

AND ASSIGNMENT OF 10 MARKS FOR EACH PAPER

CORE PAPER: PHYSICS PAPER - I

Title: - Mechanics and Properties of Matter.

Topic 1 – Moment of Inertia 09

Review of M.I., Moment of Inertia of 1) Circular disc 2) Rectangular lamina 3) Spherical Shell 4) Fly wheel.

Topic 2 – Pendulums 10

Introduction, Theory of compound pendulum, Bar pendulum, Kater's Pendulum, Bassel's Theory, Bifilar pendulum (parallel suspensions of equal lengths), Torsional Pendulum.

Topic 3 – Elasticity 07

Introduction, Equivalence of shear strain to compression and extension strains, Relation between elastic constants, Poisson's ratio of rubber tube (Theory and experimental method)

Topic 4 – Surface Tension 08

Review of S.T., relation between excess pressure and surface tension, excess pressure inside a liquid drop and soap bubble, Jaeger's method to determine Surface Tension, Factors affecting Surface Tension, Applications of Surface Tension.

Topic 5 – Viscosity and Fluid dynamics 08

Introduction, Newton's law of viscosity, streamline and turbulent flow, Critical velocity and Reynolds number, Equation of continuity, Energy possessed by liquid, Poiseuille's equation, Bernoulli's theorem and its applications to 1) Venturimeter 2) Automiser. Factors Affecting on viscosity.

Reference books:-

1) Properties of matter- D.S. Mathur

2) A Text book of properties of matter- N.S. Khare & S.Kumar

3) Physics Vol.I –David & Robert Resnick

4) University Physics-Mechanics of a particle- Anvar Kamal

CORE PAPER: PHYSICS PAPER - II

Title: - Optics and Laser

Topic 1 – Geometrical Optics and aberrations 10

Introduction, Fermat's principle, Deduction of laws of reflection and refraction by Fermat's principle, Chromatic and Spherical aberration, methods to minimize Chromatic and Spherical aberrations.

Topic 2 – Optical Instruments 08

Introduction, Types of eye-pieces, Gauss eye piece, Ramsden's eye-piece, Huygen's eye-piece, Construction, working and Application of Spectrometer and Optical bench.

Topic 3 – Interference 08

Introduction, Interference in parallel faced thin film (Reflected light only), wedge shaped film, Newton's rings and its applications.

Topic 4 – Diffraction 08

Introduction, Types of diffraction, Plane diffraction grating and its elementary theory, its application to determine wavelength, Comparison between prism and grating spectra

Topic 5 – Laser 08

Introduction, Spontaneous and Stimulated emission and absorption, Einstein's Coefficients, Population inversion, Optical Pumping, Cavity resonator, He-Ne and Ruby Laser, Properties and application.

Reference books:-

1. Ray Optics by R K Verma.

2..Text Book of Optics (new edition) – Brijlal and Subramanyam

3. Optics(second edition) – Ajay Ghatak

4. Concept of Physics – H C Verma

5. Laser and Optics – B. B. Loud

6. Optics by Mathur

CORE PAPER: PHYSICS PAPER - III

Title: - Heat and Thermodynamics

Topic 1 –Transport Phenomenon 08

Introduction, mean free path, Claussius expression for mean free path (Collision cross section), Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure

Topic 2 - Liquefaction of Gases 08

Liquefaction of gases by J-T effect, Linde's air liqefier; cooling by adiabatic demagnetization and expression for fall in temperature, experimental setup for adiabatic demagnetisation of paramagnetic substances, properties of liquid helium

Topic 3 – Thermodynamics 10

Laws of thermodynamics, Reversible and Irreversible processes, Isothermal and adiabatic process, Adiabatic relations, work done during isothermal and adiabatic processes, Entropy change in reversible and irreversible processes

Topic 4 – Heat engines 08

Introduction, Carnot's heat engine and its efficiency; Heat engine, Otto cycle and its efficiency, Diesel cycle and its efficiency, comparison between Otto and diesel engine.

Topic 5 –Refrigerator 08

General principle, Refrigeration Cycle, coefficient of performance of refrigerator, Vapor compression Refrigerator, Air conditioning (principle and applications)

Reference books:-1. Treatise on heat – Saha & Shrivastav

2. Kinetic theory of gases – V.N. Kelkar

3. Heat and Thermodynamics – Brijlal & Subrahmanyam

CORE PAPER: PHYSICS PAPER - IV

Title: - Electricity, Magnetism and Basic Electronics

Topic 1 – Varying Current: **08**

Introduction, Growth and decay of current in L-R circuit, Charging and discharging of capacitor through resistor and inductor separately. Time constant of the LR and CR circuits.

Topic 2 – A.C. Circuits: **08**

Complex number, J-Operator and its applications to AC circuits, Reactance, Susceptance, Impedance, Admittance and power factor, L-C-R circuit, series and parallel resonance circuits, sharpness of resonance and quality factor, AC bridge(Owen's bridge).

Topic 3 – Magnetostatics and Ballistic Galvanometer: **08**

Introduction, Biot and Savart's law & its application to determine magnetic induction at a point on the axis of current carrying coil of single turn and Solenoid.

Construction, theory and working of Ballistic Galvanometer, Constants of B G.

Topic 4 – Electronic circuit components and Devices: **09**

Classification of electronic circuit components as passive and active (Resistor, Capacitor, Inductor, Transformer, Switches, Relays, Diodes, Transistor, FET, SCR, UJT and IC) with their symbol and specification. Bridge rectifier with Pie-Filter, Clippers, Clampers, Zener diode and its application as a voltage regulator.

Topic 5 – Bi-junction transistor: **09**

Construction and working of transistor, input-output and transfer characteristics of CE & CB mode, Relation between α and β. Transistor as amplifier (CE mode**)**

Reference books:-

1) Principles of electronics –V.K. Mehta
2) Electronics principles- Malvino
3) Basic electronics & linear circuits- Bhargav, Kulshrstha &Gupta
4) Electricity and Magnetism – Khare & Shrivastav
5) Foundations of electromagnetic theory- Reitz & Milford
6) Electronic devices & circuits-Allen Mottershed

CORE PAPER: PHYSICS PRACTICAL OF 04 CREDITS

Group I – General Physics and Heat

1. Bar pendulum
2. Bifiler's pendulum
3. Tortional pendulum
4. Moment of Inertia of disc by annular ring
5. Poisson's ratio
6. Surface Tension liquid drop method
7. Thermal conductivity of insulator by Lee's method.
8. Viscosity of water by Poiseullie's method
9. Viscosity by stoke's method
10. Frequency of AC mains by magnetic and nonmagnetic wire
11. Newton's law of cooling – Specific heat capacity of any given liquid.
12. L C of various measuring various instruments, Errors: Instrumental errors; Bench error; Correction to the errors for more accuracy of any type of measurements. .

Group II – Electricity, electronics, and optics

1. Use of Spectrometer to determine Angle of prism
2. Dispersive power of prism
3. Diffraction grating to determine its grating element
4. LASER (to determine its wavelength of LASER beam by using diffraction grating)
5. Newton's ring (to determine Wavelength and Radius of curvature of Plano-convex lens)
6. Photo cell (verification of inverse square law)
7. Bridge rectifier and π filter - β & γ
8. Out Put Characteristics Transistor amplifier in CE mode: determination of β)
9. Zener diode as a voltage regulator
10. Temperature coefficient of resistance of Copper wire
11. Liquid lens to determine the refractive index of any liquid
12. Clipper / Clamper

Reference Books:-1) Advanced Practical physics –Nelkon

2) Practical physics - Rajopadhye and Purohit

3) Practical Physics – P R Sasi Kumar

Solapur University, Solapur

Nature of question paper for new CBCS pattern to B.Sc. I Physics

(w.e.f. June 2016)

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

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

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

a)…… b)…… c)…… d)……

2) ……. do……

3) ……. do……

4) ……. do……

5) ……. do……

6) ……. do……

7) ……. do……

8) ……. do……

9) ……. do……

10) …….do……

11) …….do……

12) …….do……

13) …….do……

14) …….do……

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

1)

2)

3)

4)

5)

6)

7)

8)

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

1)

2)

3)

B) Write the answer **(04)**

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

1)

2)

3)

Q.No.5) Solve any one of the following

1) Essay type long answer question / Derive an expression **(10)**

Example **(04)**

2) ……. Do …….

NB:

1. **At least two numerical based questions should be asked in Question No. 1**
2. **Question No. 2, 3A and 4 must be included one example to solve.**
3. **Weightage for each topic must be given as per period allotted to complete the topic.**
4. **Weightage for each topic must not be less than 10 and it should not exceed 15 marks.**

Solapur University, Solapur

Faculty of Science

B.Sc.Part- I Zoology
Syllabus

Choice Based Credit System (CBCS)
(W.e.f. June, 2016)

Solapur University, Solapur

Faculty of Science

Choice Based Credit System (CBCS)
(W.e.f. June 2016)

- **Choice Based Credit System:** With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level.

  The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

- **Outline of Choice Based Credit System:**
  1. ***Core Course:*** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
  2. ***Elective Course:*** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

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

- **Credit:** Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits.

  Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 30 marks and University Evaluation for 70 marks. It is 70+30 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

- **Conversion of marks into Grades:**

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

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

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

$$\text{SGPA} = \frac{(G_1 \times C_1) + (G_2 + C_2) + \ldots\ldots\ldots}{\sum C_i}$$

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

2. **Cumulative Grade Point Average (CGPA)**

$$\text{CGPA} = \frac{(G_1 \times C_1) + (G_2 + C_2) + \ldots\ldots\ldots}{\sum C_i}$$

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

3. **Final Grade Point Average (FGPA)**

   It will be calculated in the similar manner for the total number of credits offered for the completion of the said course.

   Where: C_i = Credits allocated for the i^{th} course.

   G_i = Grade point scored in the i^{th} paper (subject)

4. Conversion of average grade points into grades:

SGPA/CGPA/FGPA	Letter Grade
9.5 – 10	O
8.5 – 9.49	A+
7.5 – 8.49	A
6.5 – 7.49	B+
5.5 – 6.49	B
4.5 – 5.49	C+
4.0 – 4.49	C
<3.99	FC / F
	FR

- **Structure of B.Sc. Zoology Programme as per CBCS pattern**

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical	Total Credits
B.Sc. I	I	900	24	--	--	24
	II	900	24	400	16	40
B.Sc. II	III	600	18	--	--	18
	IV	700	22	600	24	46
B.Sc. III	V	500	16	--	--	16
	VI	500	16	400	20	36
Total		4100	120	1400	60	180

B.Sc. Zoology Programme:

- **Total Marks :** Theory + Practicals = 4100 +1400 =5500
- **Credits :** Theory + Practicals = 120 + 60 = 180
- Numbers of Papers Theory: Ability Enhancement Course(AECC) : 05

  Theory: Discipline Specific Elective Paper (DSE): 02

  Theory: Core Course (CC) : 34

  Total: Theory Papers : 41

  Practical: Core Course (CC) : 14

SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science
Choice Based Credit System (CBCS)
(W.e.f. June 2016)

- **Title of the Course:** B.Sc. Part-I

- **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.

- **Eligibility and Admission:** A Candidate passing 10+2 with biology MLT , dairy science , Fisheries ,Agricultural science as one of the subject and passed from state syllabus / CBSE / equivalent with minimum passing percentage of as per the directives of the higher education and Solapur university, Solapur.

- **Duration:** The duration for this program is of 3 years with semester pattern (06 Semesters)

- **Medium of Instruction:** English

- **Syllabus Structure:**
  - The University follows semester system.
  - An academic year shall consist of two semesters.
  - Each B.Sc. course shall consist of three years i.e. six semesters.
  - B.Sc. Part-I Zoology shall consist of two semesters: Semester I and Semester II.

    In semester I, there will be two core papers. Each paper is having of 100 marks. Similarly in Semester II there will be two core papers. Each paper has 100 marks weightage. English will be as Ability Enhancement Course (AECC) in both Semester I and II. English paper carries 100 marks in each semester.

    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-I Zoology sem I & II the internal assessment will be based on Internal tests, Home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as given below. Practical course examination is of 100 marks shall be conducted at the end of II semester. The practical examination of 100 marks shall also consist of 70 marks for University practical assessment and 30 marks for college internal assessment.

    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.

- **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.

  Semester – I

  Theory: (100 marks)

  University Examination (70 marks): No. of theory papers: 2

  Internal Continuous Assessment: (30 marks)

  Scheme of marking: 15 marks – Internal test

  15 marks – Home assignment / tutorials / seminars / viva/ Zoological visit/ group discussion/ outreach programs.

  Semester – II

  Theory: (100 marks)

  University Examination (70 marks): No. of theory papers: 2

  Internal Continuous Assessment: (30 marks)

  Scheme of marking: 15 marks – Internal test

  15 marks – Home assignment / tutorials / seminars / viva/ Zoological visit/ group discussion/ outreach programs...

  Practical Examination: (100 marks)

  University Examination (70 marks): No. of practical course: 1

  Internal Continuous Assessment: (30 marks)

  Scheme of marking: 20 marks – Internal test on any two practicals

10 marks – Lab Journal / Viva/attendance, / attitude/sincerity/ field

Visits etc.

Choice Based Credit System (CBCS)

(W.e.f.2016-17)

Structure for B. Sc-I Zoology

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.- I Semester - I**									
	Ability Enhancement Course(AECC)	English Paper I (communication skill)		4			100	70	30	4
	Core	Subject 1	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
	Core	Subject 2	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
	Core	Subject 3	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
	Core	**ZOOLOGY 4**	Paper I	2.5	--	--	100	70	30	2.5
			Paper II	2.5	--	--	100	70	30	2.5
Total				**24**	--	--	**900**	**630**	**270**	**24**
Class :	**B.Sc.- I Semester - II**									
	Ability Enhancement Course(AECC)	English Paper I (communication skill)		4			100	70	30	4
	Core	Subject 1	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
	Core	Subject 2	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
	Core	Subject 3	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
	Core	**ZOOLOGY 4**	Paper III	2.5	--	--	100	70	30	2.5
			Paper IV	2.5	--	--	100	70	30	2.5
Total (Theory)				**24**	--	--	**900**	**630**	**270**	**24**
	Core	Subject 1	Practical I	--	--	4	100	70	30	4
	Core	Subject 2	Practical I	--	--	4	100	70	30	4
	Core	Subject 3	Practical I	--	--	4	100	70	30	4
	Core	**ZOOLOGY 4**	Practical I	--	--	4	100	70	30	4
Total (Pract.)						**16**	**400**	**280**	**120**	**16**
Grand Total				**24**		**16**	**1300**	**910**	**390**	**40**

Abbreviations:

L: Lectures; T: Tutorials; P: Practicals; UA: University Assessment; CA: College Assessment

- **Passing Standard**

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

- **ATKT**

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

Choice-Based Credit System (CBCS) Structure for B.Sc.I Semester-I, ZOOLOGY

Class	Sem	Subject	No. of Papers/ practicals	Hrs/Week			Paper Marks	UA	CA	Credits
				L	T	P				
B.Sc.I	I	English (Ability Enhancement Course-AECC)	English paper I - Communication Skills (compulsory)	4	-	-	100	70	30	4
		Zoology	Paper I Animal Diversity I	2.5	-	-	100	70	30	2.5
B.Sc.I	I	Zoology	Paper II Cell Biology and Genetics	2.5	-	-	100	70	30	2.5
Total				9			200			Credits : 9 (Sem I)

Choice-Based Credit System (CBCS) Structure for B.Sc.I Semester-II, ZOOLOGY

Class	**Sem**	**Subject**	**No. of Papers/ Practicals**	**Hrs/Week**			**Paper Marks**			**Practical**			**Credits**
				L	**T**	**P**		**UA**	**CA**	**Marks**	**UA**	**CA**	
B.Sc. I	II	English (Ability Enhancement Course-AECC)	English paper II - Communication Skills	4	-	-	100	70	30				4
	II	Zoology	Paper III Animal Diversity – II	2.5	-	-	100	70	30				2.5
	II	Zoology	Paper-IV Ecology,Ethology, Evolution and Applied Zoology	2.5			100	70	30				2.5
		Practical Zoology		-	-	4				100	70	30	4
Total													Credits : 13 (Sem II)

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination UA (University Assessment): University Theory paper shall be of 70 marks for 3.00 hrs duration CA (College Assessment): The internal examination for theory and Practical course.

B.Sc.I Semester-I & II, ZOOLOGY
Choice Based Credit System (CBCS) Structure

Semester- I (Theory)

Paper	Title of the paper: I & II	M arks
I	Animal Diversity I,	100(70UA + 30 CA)
II	Cell Biology and Genetics	100(70UA + 30 CA)

Semester-II (Theory)

Paper	Title of the paper: III & VI	M arks
III	Animal Diversity –II	100 (70UA + 30 CA)
VI	Ecology, Ethology, Evolution and Applied Zoology	100 (70UA + 30 CA)

PRACTICAL TO BE TAKEN AT THE END OF SEMESTER-II

Practical	Title of the practical	M arks
I	Practical Based on Theory Papers I,II,III & IV	100 (70UA + 30 CA)

SEMESTER – I

Paper I: Animal Diversity I
(Total credits 2.5, Contact Hrs 37.5)

Unit I: Contact Hrs: 15.5, Credits: 1.0

1) Five kingdom classification: Salient features and classification upto classes of following kingdoms with suitable examples –

A) Kingdom: Protista, B) Kingdom: Animalia with reference to phyla Porifera, Coelenterata, Platyhelminthes, Nemathelminthes and Annelida. [Contact Hours 5]
(These topic be taught in practical classes)

2) Protista – Type Study – Paramecium : Morphology, Locomotion, Nutrition Osmoregulation, Reproduction (Binary fission and Conjugation) [Contact Hours 6]

3) Porifera – Type Study – Sycon- Cell types and Canal system [Contact Hours 4.5]

Unit II: Contact Hrs: 22, Credits: 1.5

4) Coelenterata – Type Study – Hydra: Morphology (including cell types), Locomotion, Nutrition and Reproduction [Contact Hours 5]

5) Platyhelminthes – Type Study – Tape worm : Morphology, life cycle and Parasitic adaptations [Contact Hours 5]

6) Annelida – Type study – Earthworm (*Pheretima posthuma*): Morphology, Body wall, Coelom, Digestive system, Circulatory system, Excretory system, Reproductive system (copulation, fertilization and cocoon formation) and Nervous System. [Contact Hours 12]

Total contact Hours: [37.5]

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SEMESTER –I
Paper – II Cell Biology and Genetics

(Total credits 2.5, Contact Hrs 37.5)

Unit I: Contact Hrs: 22, Credits: 1.5

1) Compound and Electron microscope: Principle and applications [Contact Hours 2]
2) Ultrastructure of Prokaryotic and Eukaryotic cells [Contact Hours 2]
3) Study of Nucleus with reference to Nuclear membrane, Nucleoplasm, Chromatin and Nucleolus. [Contact Hours 3]
4) Study of Ultra structure and functions of the following [Contact Hours 15]
i) Plasma membrane (Fluid Mosaic Model)
ii) Mitochondria
iii) Endoplasmic reticulum
iv) Golgi complex
v) Lysosome
vi) Ribosomes
vii) Giant chromosomes – Polytene and lamp brush Chromosome

Unit II: Contact Hrs: 15.5, Credits: 1.0

5) Mendelian inheritance : Law of dominance, segregation and independent assortment with suitable examples. [Contact Hours 3]

6) Study of Co- dominance and incomplete dominance with suitable examples [Contact Hours 2]
7) Multiple alleles – Characterstics, ABO- Blood group system & Rh factor and Coat colour in rabbit [Contact Hours 3.5]
8) Sex determination: Chromosomal theory of sex determination, XO, XY, ZW, Environmental and Hormonal methods of sex determination. [Contact Hours 3]

9) Human genetics [Contact Hours 4]
a) Phenyl keton uric imbecility (PKU)
b) Sickle cell anemia

Total contact Hours: 37.5

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SEMESTER –II

Paper – III - Animal Diversity –II
(Total Credits: 2.5, Contact Hrs 37.5)

Unit I (Contact Hrs 15, Credits 1.0)

1) Classification of Chordates : Salient features and classification upto orders of the following with suitable examples – [Contact Hrs 5]

A) Protochordata : Urochordata and Cephalochordata

B) Craniata : i) Agnatha- Cyclostomata

ii) Gnathostomata : a) Superclass : Pisces

b) Superclass :Tetrapoda : Class - Amphibia

(These topic be taught in practical classes)

2) Cyclostomata: General Characters, Ammocoetus larva [Contact Hrs 3]

3) Fishes :

a) Types of fins and scales

b) Structure of gills in cartilaginous and bony fish

c) Mechanism of gill respiration [Contact Hrs 7]

Unit II (Contact Hrs 22.5, Credits 1.5)

4) Amphibia: Type Study – Frog (*Rana tigrina*) [Contact Hrs 20]

a) Morphology

b) Histological structure of skin

c) Digestive system

d) Respiratory system and mechanism of respiration

e) Blood vascular system : Blood, Heart, Arterial and Venous system

f) Excretory and Reproductive system (Male and Female) , Structure of Egg and sperm

g) Nervous system.

5) Neotany and Parental care in Amphibians. [Contact Hrs 2.5]

Total contact Hrs: [37.5]

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Semester II

Paper – IV

Ecology, Ethology, Evolution and Applied Zoology

(Total Credits: 22.5, Contact Hrs 37.5)

Unit I (Contact Hrs 22.5, Credits 1.5)

I) Ecology

1. Introduction, definition, aim and scope of Ecology [Contact Hrs 3]

2. Biotic factors: Brief idea of following animal associations with suitable examples
A) Intraspecific associations: i) Beneficial: Mate and reproduction, Parental care, Groupism, and Social behaviour.
ii) Harmful: Cannibalism and Competition
B) Interspecific associations: Neutralism, Symbiosis (Commensalism & Mutualism), Antagonism (Predation and Parasitism). [Contact Hrs 6.5]

3. Abiotic factors : Introduction and effects on Plants and Animals :
i) Temprature ii) Light iii) Water iv) Humidity v) Soil [Contact Hrs 4]

4.Brief idea (definition) of Species, Community, Niche, Ecosystem, Biome and Biosphere. [Contact Hrs 4]

5.Grass land and Pond ecosystems with reference to Food chain, Ecological pyramids and Energy flow. [Contact Hrs 3]

6. .Ecological successions : Introduction and Types ,Primary and secondary succession. [Contact Hrs 2]

Unit II (Contact Hrs 15, Credits 1.0)

II) **Ethology** [Contact Hrs 4]

1. Mimicry – Butterflies and Camouflage – Chameleon
b) Courtship behavior in birds
c) Social behavior in Honey bees: Casts, swarming, absconding, Nauptial flight and communication (waggle and round dance).

III**) Evolution** [Contact Hrs 5]

a) Organic evolution concepts
b) Paleontological evidences
c) Anatomical evidences

IV) **Applied Zoology** [Contact Hrs 6]

1. Brief idea (definition and scope) of Sericulture, Apiculture, Poultry science, Dairy science, Fishery science, Pearl culture, Lac culture, Goat farming and Piggary.
2. Vermitechnology : Techniques and importance of Vermiculture, Vermicompost and Vermiwash

Total contact Hrs: [37.5]

List of Recommended Books for Semester I syllabus:

1) Hyman, L. H. – The invertebrates, Vol. I (McGraw Hill)
2) Hyman L.H. – The invertebrates, Vo. II (McGraw Hill)
3) Barnes R. D. – Invertebrate Zoology (W.B. Saunders Co.)
4) Pearse / Buchschaum – Living invertebrates, Blackwell Scientific Publications, California
5) Parker and Haswell – A Text Book of Zoology – Invertebrates Vol. I Edited by Marshall and Williams, C.B.S. Publishers and Distributors, New Delhi.
6) P. S. Dhami and J.K. Dhami – Invertebrates, S. Chand and Company. New Delhi
7) De Robertis EDP and De Robertis EME – Cell and Molecular Biology
8) C.B. Powar – Cell Biology, Himalaya Pub. House
9) Verma P. S. and Agarwal V. K. – Genetics, S. Chand and Company
10) Strickberger – Genetics. C Millian Publications
11) Winchester – Genetics, Oxford Publication
12) E. L. Jordan & P. S. Varma – Invertebrate Zoology
13) Genetics by P.P. Meyyan
14) A Text Book of Invertebrates – N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan
15) R. L. Kotpal – Modern Text Book of Zoology, Invertebrates
16) Cell Biology – Dr. N. Arumugam
17) P. S. Varma & V. K. Agarwal – Cell Biology, Genetics, Molecular Biology, Evolution and Ecology
18) R. P. Meyyan, N, Arumugam – Genetics & Evolution
19) P. K. Gupta – Cell and Molecular Biology
20) Search engine- www.wikipedia.org

List of Recommended Books for Semester II syllabus:

1) Evolution & Biostatistics – by N. Arumugam & R. P. Meyyan.
2) Environmental Studies – Based on UGC syllabus – N. Arumugam & V. Kumaresan
3) Organic Evolution – N. Arumugam
4) Chordate Zoology – A. Thangamani, S. Prasanna Kumar, N. Arumugam, L. M. Narayanan
5) Ecology – By E. P. Odum
6) The Protochordates – by S. H. Bhamrah and Kavita Juneja – Anmol Publications, New Delhi
7) Introduction to Protochordata – S. H. Bhamrah and Kavita Juneja – Anmol Publications, New Delhi
8) Chordate Zoology – S. Chand Company, New Delhi
9) Text Book of Zoology – Vertebrates, Vol. II – T. J. Parker and W. A. Haswell Edited by Marshall and Williams, CBS Publications and Distributors, New Delhi.
10) E. L. Jordan – Chordate Zoology, S. Chand and Company, New Delhi.
11) Odum – Ecology (Amerind)
12) Fundamentals of Ecology – Odum – (Saunders)
13) Ecology – Rickelfs (W.H. Freeman)
14) Economic Zoology – Venkitraman (Sudarshana Publishers)
15) The Foundations of Ethology (Spinger Verlog)
16) Economic Zoology – Shukla and Upadhyaya – Rastogi Publications
17) Immelamann – Introduction of Ethology (Plenum Press)
18) A Text Book of Chordates – A. Thangamani, L. M. Narayan, S. Prasannakumar, N. Arumugam
19) R. L. Kotpal – Modern Text Book of Zoology, Vertebrates
20) A. Arumugam, J. Johnson Rajeshwar, S. Arumuam, R. Ram Prabhu – Applied Zoology

Practical Course in Zoology for B. Sc. I

Semester I and II (Credits 4)

I. CD/Model/Chart Anatomical observations and detail explanation of Earthworm:

i) Systematic position and External morphology
ii) Digestive System
iii) Reproductive system
iv) Nervous system

II. CD/Model/Chart observation and detailed explanation of Earthworm various parts.

Septal nephridia, Setae, Spermatheca, Ovary,

III. Cytological Preparation:

1) Stained preparation of Mitochondria using Janus green B from any suitable material.
2) Stained preparation of Nucleus from suitable material.

IV. Examples in Genetics – Examples based on Monohybrid, Dihybrid and Blood groups and Coat colour in rabbit (10 examples are to be solved).

V. Identifications / Spottings:

A) Animal classification - CD/Model/Chart/Slides/Virtual CD

1) Study of Five kingdom classification.
2) Salient features and classification upto classes of following kingdoms with suitable examples –
A) Kingdom: Protista - Amoeba, Paramoecium, Euglena
B) Kingdom: Animalia with reference to phyla:
i) Porifera: Sycon, Spongilla, Hyalonema
ii) Coelenterata: Hydra, Obelia, Aurelia, Sea anemone and Coral iii) Platyhelminthes: Planaria, Liverfluke, Tape -worm iv) Nemathelminthes: Ascaris
v) Annelida: Nereis, Earthworm, Leech
3) Classification of Chordates : Salient features and classification upto orders of the following with suitable examples –
Protochordata:
i) Urochordata - Herdmania, ii) Cephalochordata: Amphioxus
A) Craniata: i) Agnatha, Cyclostomata: Petromyzon / Myxine
ii) Gnathostomata:
a) Superclass: Pisces: I) Class – Chondrichthyes: Dogfish, Sting – ray / Electric – Ray. II) Class – Osteichthyes: Flying fish, Sea- Horse, Eel, Labeo.
6) Super class: Tetrapoda: Class - Amphibia: Ichthyophis, Frog, Toad and Salamander.

B) Study of Earthworm : CD/Model/Chart
Sections of Earthworm Passing through Pharynx, Gizzard, Typhlosole region, study of cocoon

C) **Study of Paramecium (CD/Model/Chart/Virtual) :** Binary fission and conjugation , Demonstration of observation of Protozoans from samples/cultures

D) **Study of Sycon (CD/Model/Chart)**: Spicules , T.S. and L. S. of Sycon

E) Study of Hydra (CD/Model/Chart/Slides): – Whole mount with bud, Sections through Body, Ovary and Testis

E) Study of Tapeworm (CD/Model/Chart/Slides): **-** Scolex, Mature and Gravid proglottids, Hexacanth larva

F) Study of Fishes (CD/Model/Chart/Lab specimens): **–**
Types of **fins**: Paired, Un-paired & Types of Tail fins
Types of **Scales**: Placoid, Cycloid & Ctenoid
Study of **Gills:** Cartilaginous & Bony fish

H) Study of Mimicry- Butterflies and camouflage – chameleon (CD/Model/Chart/Lab specimens):

I) Study of Honey bee (CD/Model/Chart/Lab specimens): Queen, Worker, Drone and Bee hive

J) CD/Model/Chart – Anatomical observations and detail explanation of frog.
Heart, Digestive system, Lungs, Kidneys, Ovaries, Testis, Blood and Brain. Skeleton - **Axial**: Skull, Lower jaw, Hyoid apparatus & Vertebrae
Appendicular: Pectoral & Pelvic girdles, Fore & Hind limb bones

K) Study Tour / – Visit to any suitable place of Zoological interest to study animal biodiversity / research center **(**Up to four days) and submission of report. All necessary precautions must be taken while organizing study tour with reference to the safety of students.

(Or)

A small project report or review article submission of any one topic related to any Ecological and Applied Zoological interest.

B.Sc. Part I Semester I and Semester II (Zoology)

Nature of Question Paper for University Practical Exams

Total Marks [70]

Scheme of Marking for Practical	**Marks**
Q.1. CD/Model/Chart Anatomical observations and detail explanation of Earthworm with functions(viva)	13
Q.2. CD/Model/Chart observation and detailed explanation of Earthworm various parts with functions(viva)	8
Q.3. Genetics example	10
Q.4. Cytological preparation	8
Q.5. Spotting	10
Q.6. Tour Report/ project report or review article submission	8
Q.7. Laboratory Record	8
Q8: Viva –Voce (General)	5

Examination Pattern (UA - University assessment)

The examination for theory (70 marks) is conducted semester wise by university as per University Time Table.

Nature of Theory question paper for each theory paper.

Solapur University, Solapur
Faculty of Science
(New CBCS)
B.Sc. I Zoology

Time: - 2 hrs 30 Minutes **Total Marks-70**

Q. 1) Multiple choice questions **(14)**

i) ----------

a) b) c) d)

ii)
iii)
iv)
v)
vi)
vii)
viii)
ix)
x)
xi)
xii)
xiii)
xiv)

Q. 2) Attempt any seven (out of nine) of the following **(14)**

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

Q. 3 A) Attempt any two (out of three) of the following **(10)**

i)
ii)
iii)

B) Solve **(04)**

Q. 4) Attempt any two (out of three) of the following **(14)**

i)
ii)
iii)

Q. 5) Attempt any two (out of three) of the following **(14)**

i)
ii)
iii)

The examination for Practical (70 marks) is conducted annually at the end of second term of academic year by university as per University Time Table.

CHAIRMAN
B. O. S. ZOOLOGY