

official Acad. Section V.V

Revised Syllabus only for SS in Zoology & Biotechnology for 2018-20 Session

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# Semester wise Syllabus For Postgraduates

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Prof Dr. H.S.RATHORE  
DEAN  
Faculty of Life Sciences  
Vikram University,  
UJJAIN, 456 010. India

CBCS Pattern

Session

2018-20

M.Sc. Biotechnology

S.S. In Zoology & Biotechnology

Vikram University,

Ujjain

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Pages

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School of Studies in Zoology &  
Biotechnology  
Vikram University,  
Ujjain

Syllabus  
M.Sc. Biotechnology as per ordinance 14  
(For UTD)

Revised course structure  
Choice based credit system (CBCS)  
2018-20

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# Scheme of Examination 2018-2020

## M.Sc. Biotechnology Sem-I (CBCS)

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Biotechnology wef 2018-20 Academic sessions

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S. No	Course code	TITLE OF COURSE	Course type	MARKS			
				Internal examination marks	University examination marks	Total marks	Credits
01	BT 101	Paper 1: Cell and Molecular Biology	Core	40	60	100	5
02	BT 102	Paper 2: Immunology & Molecular Diagnostics	Core	40	60	100	5
03	BT 103	Paper 3: Molecular Endocrinology and Reproductive Technology	Core	40	60	100	5
04	BT 104	Paper :4 Microbiology	*Generic elective	40	60	100	5
05	BT 105	OR Biostatistics, Biodiversity & wild life					
06	ED 106	Entrepreneurship Devpt.	**Skill Devpt. course	30	50	80	4
07	<del>ZOT</del> 107 BT	Practical based on theory Papers	Core	16	24	40	2
08	<del>ZOT</del> 108 BT	Comprehensive <u>Viva-voce</u> (Virtual credits)	Core	-	80	80	4
Total Marks				208	394	600	30

- \*Any 01 out of 02 elective can be opted.
- \* Elective papers shall be taught only if faculty is available.
- \*\* Common course offered by University

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# Scheme of Examination 2018-2020

## M.Sc. Biotechnology Sem-II CBCS

Scheme of teaching and examination under semester pattern Choice Based Credit System (CS) for M.Sc. Program in Biotechnology wef 2018-20 Academic session

Course code	TITLE OF COURSE	Course type	MARKS			
			Internal examination marks	University examination marks	Total marks	Credits
BT 201	Paper 1: Enzyme Technology	Core	40	60	100	5
BT 202	Paper 2: Environmental Biotechnology	Core	40	60	100	5
BT 203	Paper 3 Biomolecules and metabolism	Core	40	60	100	5
BT 204	Paper:4 Bioinstrumentation OR	*Generic elective	40	60	100	5
BT 205	Molecular Cell Biology and Genetics					
CS 206	Communication Skill	**Skill Devpt. course	30	50	80	4
BT 207	Practical based on theory Papers/ Field work/ MOOC/ Skill Development	Core	16	24	40	2
BT 208	Comprehensive Viva-voce (Virtual credits)	Core	-	80	80	4
Total Marks			206	394	600	30

- \*Any 01 out of 02 elective can be opted.
- \* Elective papers shall be taught only if faculty is available.
- \*\* Common course offered by University

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# Scheme of Examination 2018-2020

## M.Sc. Biotechnology Sem-III

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Biotechnology we f 2018-20 Academic session

S. No.	Course code	TITLE OF COURSE	Course type	MARKS			
				Internal examination marks	University examination marks	Total marks	Credits
01	BT 301	Paper 1: Genetic Engineering	Core	40	60	100	5
02	BT 302	Paper 2: Bioprocess Engineering <i>&amp; Bioinformatics</i>	Core	40	60	100	5
03	BT 303	Paper 3: Industrial Biotechnology and animal tissue culture	Core	40	60	100	5
04	BT 304	Paper: 4 Plant Biotechnology	*Discipline specific Elective	40	60	100	5
05	BT 305	OR Genomics and Proteomics					
06	PD 306	Personality Development	**Skill Devpt. course	30	50	80	4
07	<del>ZOLBT</del> 307	Practical based on theory Papers/ Survey	Core	<del>15</del> 16	<del>25</del> 24	40	2
08	<del>ZOIBT</del> 308	Comprehensive Viva-voce (Virtual credits)	Core	-	80	80	4
Total Marks				206	394	600	30

\*Any 01 out of 02 elective can be opted.

\* Elective papers shall be taught only if faculty is available.

\*\* Common course offered by University

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## Scheme of Examination 2018-2020

### M.Sc. Biotechnology Sem-IV CBCS

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Biotechnology we f 2018-20 Academic session

S. No.	Course code	TITLE OF COURSE	Course type	MARKS			
				Internal examination marks	University examination marks	Total marks	Credits
01	BT 401	Project work/ Onsite training Project presentation Project Report Assessment <i>Viva Voce</i>	Core	100 Project work + Presentation	140 Project report Assessment + <i>Viva-Voce</i>	240	12
02	BT 402	Industrial visit/ Scientific Lab visit	Core	30 (Report)	50 ( <i>Viva-Voce</i> )	80	4
03	BT 403	Review writing	Core	30 (write up)	50 ( <i>Viva-Voce</i> )	80	4
04	BT 404	Seminar	Core	25 (write up)	35 Presentation	60	3
05	BT 405	Poster presentation	Core	25 Poster	35 Presentation	60	3
06	BT 406	Comprehensive <i>Viva-voce</i> (Virtual credits)	Core	-	80	80	4
		Total Marks		210	390	600	30

Grand Total M.Sc. Biotechnology 2018-20

Marks: 2400

Credits: 120(Each credits is equal 20 marks)

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**VIKRAM UNIVERSITY, UJJAIN**  
**ENTREPRENEURSHIP DEVELOPMENT CELL**

Courses offered by Entrepreneurship Development Cell for P.G. students of U.T.D. of Vikram University.

S.NO.	NAME OF COURSE	CREDIT	SEMESTER
1	ENTREPRENEURSHIP DEVELOPMENT	4	I
2	COMMUNICATION SKILLS	4	II
3	PERSONALITY DEVELOPMENT	4	III
4	TOURISM MANAGEMENT	4	IV*

\*Optional

**Note:** These classes will be conducted tentatively from 1<sup>st</sup> Nov 2018 from Monday to Thursday between 10 A.M to 11 A.M in School of studies in Commerce Vagdevi Bhavan.

The detailed syllabus of all courses is attached.

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VIKRAM UNIVERSITY, UJJAIN (M.P.)  
SCHOOL OF STUDIES IN COMMERCE

ENTREPRENEURSHIP DEVELOPMENT

Marks: 100

Credit for each course

Credit: 04

30 hours/semester

Lectures-03/week	Tutorial-01/week	Total-04 classes/week
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**Course Objectives:**

To prepare the budding entrepreneurs and to provide the students seedbeds of entrepreneurship at the entry level and enhance their entrepreneurial skills.

**Course Contents:**

**Unit I: Introduction**

Entrepreneurship - meaning, nature, importance, specific traits of Entrepreneurs, role of entrepreneurs in Indian Economy.

**Unit II: Analysis of Entrepreneur opportunities**

Defining, objectives, identification, process of sensing, accessing the impact of opportunities and threats.

**Unit III: Search of business idea**

Preparing for business plan, legal requirements for establishing of a new unit-procedure for registering business, starting of new venture, product designing / branding, research and development, selection of forms of business organization.

**Unit IV: Role of Supportive Organizations**

D.I.C and various government policies for the development of entrepreneurship Government schemes and business assistance, subsidies, role of banks.

**Unit V: Market assessment**

Meaning of market assessment, components and dimensions of market assessment, Questionnaire preparations, survey of local market, visit to industrial unit, business houses, service sector etc. Submission of survey based report on one successful and unsuccessful entrepreneurs.

**Suggested Readings:**

- |  |                     |
|--|---------------------|
| 1 Entrepreneurship Development                           | Dr.C.B.Gupta        |
| 2 Dynamics of Entrepreneurial Development and Management | Vasant Desai        |
| 3 Innovation and Entrepreneurship                        | Peter F.Drucker     |
| 4 Entrepreneurship Development                           | G.A.Kaulgud         |
| 5 Entrepreneurship-Need of the Hour                      | Dr.Vidya Hattangadi |
| 6 Entrepreneurship Development                           | Dipesh D. Uike      |

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## COMMUNICATION SKILLS

Marks: 100

Credit for each course

Credit: 04

30 hours/semester

Lectures-03/week	Tutorial-01/week	Total-04 classes/week
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### Course objective:

The objective of this paper is to make students aware of the practical significance of good communication skills and help them in acquiring competence in reporting ,drafting and development of negotiations skills.

### Course Contents:

#### Unit I: Introduction:

Definition, nature, objects, elements and importance of communication, principles and practices, models of communication, types of communication,.

#### Unit II: Communication skills and soft skills

Interviewing and group discussion, resume preparation , etiquette and manners, self management, body and sign language, presentation skills, feedback & questioning technique: objectiveness in argument (Both one on one and in groups).

#### Unit III: Concept to effective communication

Dimensions and directions of communication, means of communication, 7C's for effective communication.

#### Unit IV: Listening skills

Importance of listening skills, good & bad listening , communication channels, types of communication medium- audio, video, digital, barriers of communication.

#### Unit V: Public speaking and reporting

effective public speaking and its principles, interpretation and techniques of report writing, letter writing, negotiation skills.

### Suggested Reading:

Business Communication- Royan and V.lesikar, John D. Pettit, JR.Richard D.Irwin, INC

Business communication- K.K. Sinha

Business Etiquettes – David Robinson

Business communication – Dr. Nageshwar Rao and Dr. R.P. Das

Effective business communication- Morphy Richards

8

VIKRAM UNIVERSITY, UJJAIN (M.P), SCHOOL OF STUDIES IN COMMERCE  
PERSONALITY DEVELOPMENT

Marks: 100

Credit for each course

Credit: 04

30 hours/semester

Lectures-03/week	Tutorial-01/week	Total-04 classes/week
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**Course Objectives:**

To prepare student with the aim of developing personality for leadership & awareness to develop an ideal citizenship values.

**Course Contents:**

**Unit I: Introduction**

Personality development- concept, types, role and impact, developing self awareness, projecting a winning personality.

**Unit II: Personality assessment**

Personality assessment and testing- resume writing- types, contents, formats, interviewing skill , group discussion, JAM sessions, persuasive communication .

**Unit III: Communication skill**

Practice on oral/spoken communication skill and testing-voice and accent, feedback and questioning techniques, objectives in a argument.

**Unit IV: Presentation skills**

Skills and techniques, etiquette, project/assignment presentation, role play and body language, impression management.

**Unit V: Personality development activities**

Leadership activities, motivation activities, team building activities, stress and time management techniques, creativity and ideation.

**Suggested Readings:**

Business Communication- Royan and V.lesikar, John D. Pettit, JR.Richard D.Irwin, INC.  
Personality Development and soft skills- Barun K. Mitra, Oxford Publisher.  
Personality Development –Rajiv K.Mishra, Rupa Publisher.

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VIKRAM UNIVERSITY, UJJAIN (M.P.), SCHOOL OF STUDIES IN COMMERCE

TOURISM MANAGEMENT

Marks : 100

Credit for each course

Credit:04

30 hours/semester

Lectures-03/week	Tutorial-01/week	Total-04 classes/week
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**Course Objective:**

The course is of utmost importance when the industry is poised to take a leap forward and therefore, the cause assumes greater significance for understanding the resources development, modernization syndrome in the field of tourism.

**Course Contents:**

**UNIT I: Introduction**

Concept of tourism & importance in economy, types of tourism, tourism in Madhya Pradesh history and development ,Geography, Climate, Forest , River and Mountain.

**UNIT II: Overall Scenario**

Present scenario, planning, development and opportunities. Social and Economical impact of tourism, role of public and private sector in the promotion of tourism.

**UNIT III: Tourism Resources**

Physical and Biographical ,Tourist satisfaction and service quality-Transport accommodation, other facilities and amenities available in Madhya Pradesh. Role of tourist service provider, heritage site in M.P.

**UNIT IV: Financial aspects of Tourism**

Requirements of capital investment, sources of finance, Madhya Pradesh State Tourism Development Corporation Limited - funds, finance, policies, packages and its role for the development of tourism in madhyapradesh.

**UNIT V: Practical training**

Case studies of popular tourist places and tourist statistics in Madhya Pradesh, Analytical studies of tourist arrivals trends.

**Suggested Readings:**

Ancient Geography of M.P-Bhattacharya D.K

All district Gazettes of M.P

Tourism planning –Gunn. Clare A

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Revised Syllabus only for SS in Zoology & Biotechnology for 2018-20 Session

TABLE: GRADES, GRADE POINTS AND RANGE OF PERCENTAGE OF MARKS

Letter Grade	Grade Points	Percentage Range of Marks
O - Outstanding	10	Above 80.0%
A <sup>+</sup> - Excellent	9	Above 70.0 - 80.0%
A - Very Good	8	Above 60.0 - 70.0%
B <sup>+</sup> - Good	7	Above 55.0 - 60.0%
B - Above Average	6	Above 50.0 - 55.0%
C - Average	5	Above 45.0 - 50.0%
P - PASS	4	40.0 - 45.0%
F - FAIL	0	Less than 40.0%
Ab - Absent	0	--

**Note:** While calculating percentage of Marks and for determination of the Grade rounding of Marks shall not be done.

**The Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)**

The UGC recommended the following procedure to The Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The SGPA is the ratio of sum of the product of the number of credits with the Grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i. e.

$$SGPA (S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where,  $C_i$  – is the number of credits of the  $i^{th}$  course and  
 $G_i$  – is the Grade Point scored by the student in the  $i^{th}$  course

- ii. The CGPA is also calculated in the same manner taking into account all the courses undergone by a student overall the semesters of a program, i. e.

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

Where,  $S_i$  – is the SGPA of the  $i^{th}$  semester and  
 $C_i$  – is the Total number of credits in that semester.

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

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# Revised Syllabus only for SS in Zoology & Biotechnology for 2018-20 Session

## Illustration of computation of SGPA and CGPA and format for Transcripts

### i. Computation of SGPA and CGPA

#### Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course- 1	3	A	8	3 x 8 = 24
Course- 2	4	B+	7	4 x 7 = 28
Course- 3	3	B	6	3 x 6 = 18
Course- 4	3	O	10	3 x 10 = 30
Course- 5	3	C	5	3 x 5 = 15
Course- 6	4	B	6	4 x 6 = 24
	<b>20</b>			<b>139</b>

Thus,  $SGPA = 139 / 20 = 6.95$

#### Illustration for CGPA

Points	Semester- 1	Semester- 2	Semester- 3	Semester- 4	Semester- 5	Semester- 6
Credits	20	22	25	26	26	25
SGPA	6.9	7.8	5.6	6.0	6.3	8.0

Thus,  $CGPA = 20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6 + 26 \times 6.3 + 25 \times 8 / 144 = 6.73$

- ii. **Transcript (Format):** Based on the above, on Letter Grades, grade points and SGPA and CGPA, the Vikram University may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20  
M.Sc. Biotechnology  
Semester I  
Paper I

**Core BT PG 101. CELL AND MOLECULAR BIOLOGY**

**UNIT-1**

1. Molecular organization of Plasma Membrane
2. Modes of transport across Plasma Membrane
3. Structure & function of Microfilaments
4. Structure & function of Microtubules
5. Structure & function of connexins
6. Structure & function of Integrins

**UNIT-2**

1. Smooth Endoplasmic Reticulum (SER)
2. Rough Endoplasmic Reticulum (RER): Role in the synthesis, modification and targeting protein
3. Eukaryotic Cell Cycle: Check points, genetic regulation by CdK & cyclins.
4. Biology of Cancer: Types, development and causes.
5. Apoptosis: Definition, mechanism and significance.
6. Various modes of cell signaling.

**UNIT-3**

1. Nuclear Envelope (NE): Ultra structure of pore complex, import of proteins and transport of RNA.
2. Metaphase chromosome: Molecular organization of chromatin based on nucleosome concept, nuclear scaffold
3. Genomic organization in Eukaryotes: 'C' value paradox, repetitive and non repetitive DNA.
4. Molecular structure of DNA: A, B and Z forms.
5. Molecular mechanism of replication of prokaryotic DNA.
6. DNA damage and repair: general process.

**UNIT-4**

1. Genetic code: Universal and exceptional.
2. Transcription in Prokaryotes: Typical features.
3. Transcription in Eukaryote by pol II: Typical features
4. Translation: The general process in prokaryotes and eukaryotes.
5. Gene regulation in Prokaryotes (lac-operon): Repressor and induction, positive and negative control, gratuitous inducer (IGPT).
6. Gene regulation in Eukaryotes: Different levels of regulation of gene expression.

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REFERENCES BOOKS :

1. Molecular cell Biology: J. Darnell ,H.Lodish and D. Baltimore scientific American book,inc. USA.
2. Molecular Biology of the cell: B.Alberts, D.Bray , J.Lewis ,M.Raff, and J.D.Watson ,Garland Publisher inc. N.Y.
3. The science of genetics : Atherly , A.G., J.R. Girton and J.F. Mc Donald, Saunders college publishing Co. ITP N.Y.
4. Genetics : Analysis and Principles : Brooker R.J. Benjamin / Cummings, Longman .inc.
5. Genetics : The continuity of Life , Fairbanks, D.J. and W.R. Anderson, Brooks / cole Publishing co. ITP NY,
6. Principal of Genetics : Gardner, E.J. , M.T. Simons and D.P. Snustad Inc.
7. Genes VI & VII Lewin , B. Oxford University.
8. Molecular Biology of Gene : Watson J.D., N.H. Hopkins, J.W. Roberts ,and Weiner The Benjamin Pub. Co. inc.Tokyo.
9. Principal of cell & Molecular Biology : Lewish j.Klensmith and M.Kish , Harper Collins College Pub. USA.
10. The cella Molecular Approach : Geoffrey M.Cooper ,ASM Press DC.USA.
11. Concept of Genetics : Williams S. Klug and Michael R. Cummings, Prentice Hall International Inc. USA.

LIST OF PRACTICALS:

1. Study of chromosome behavior during Mitosis & Meosis.
2. Calculation of mitotic index in growing root tips.(onion/garlic)
3. Influence of chemical (insecticide / drug ) on Mitosis and observe breakage of chromosomes at anaphase .
4. Barr- Body(sex-chromatin ) preparation in buccal epithelial cells.
5. Chromosomes bridge & Lagging chromosomes in permanent Slids.
6. Culture of locally available **Drosophila** w.m. preparation of eggs, larva, adult Male & female .
7. Squash preparation : polytene chromosomes in the larva salivary gland of locally available **Drosophila OR chironomus** .
8. Study of liver OR whole mount preparation (slide) of **Drosophila** mutants obtained from recognized stock center only.
9. Demonstration of mitochondria by vital staining.
10. Use of Light Microscope, calculation of magnification , measurements of cell nucleuse NC ratio , counting cells/ field (hepatic OR testicular )
11. Colorimetric estimation of glucose , cholesterol , protein , RNA & DNA., ascorbic acid.
12. Absorption spectra of any colored solution of a substance.
13. Chromatography of **Drosophila** eye pigment.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester I  
Paper II

**Core BT PG 102. Immunology and Molecular Diagnostics**

**Unit- 1**

1. Component of Innate and Acquired Immunity.
2. Organs of the Immune system: primary and secondary lymphoid organs.
3. Cells of the Immune system.
4. Complement system.
5. Immunoglobulins: structures and classes.
6. Inflammatory responses.

**Unit- 2**

1. Antigen processing and presentation.
2. Major Histocompatibility complex.
3. B cell receptors.
4. B cell maturation, activation and differentiation.
5. T cell receptors.
6. T cell maturation, activation and differentiation.

**Unit-3**

- 1 Hypersensitivity – Type I – IV.
- 2 Autoimmunity and Autoimmune diseases.
- 3 Transplantation Immunology.
- 4 Hybridoma technology and Monoclonal Antibodies.
- 5 Recombinant vaccines and clinical applications.
- 6 Microchips and their applications.

**Unit- 4**

- 1 Protein based molecular diagnostics by immunoproteomics, ELISA.
- 2 Protein based molecular diagnostics by western blotting.
- 3 Real time PCR methodologies in clinical diagnostics.
- 4 Molecular diagnostics of some common genetic and non- genetic diseases e.g. trinucleotide repeats, fragile X Syndrome.
- 5 Molecular diagnostics of diabetes mellitus and cystic fibrosis
- 6 Genetic counselling.

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**REFERENCES: -**

1. Immunology by Janis Kuby.
2. Essential Immunology By I.M.Roitt ELBS edition.
3. Fundamentals of Immunology by William Paul.
4. Immunology : An Introduction by Tizzart
5. Advance Immunology by David Male & others .
6. A Hand Book of Practical and clinical Immunology by G.P.Talwar & S.C.Gupta.
7. The enzyme linked Immunosorbent assay (ELISA) – Volume 1 & 2 by Alister Voller and Danis Bidwell.
8. W.B. coleman & GJ Tsongalis Molecular diagnosis for the clinical Laboratories, 2<sup>nd</sup> edition
9. Francesco falciani, Microarray technology through Applications, Taylor & Francis,2007
10. Jochen decker , Molecular diagnosis of Infectious diseases, Humana Press.

**PRACTICALS**

1. Blood film preparation and identification of cell.
2. Demonstration of lymphoid organs and their microscopic Examination .
3. Immunization and production polyclonal antibodies
4. Immunodiffusion.
5. Agglutination .
6. ELISA Antibody capture Elisa
7. ELISA Antigen capture Elisa.
8. Sepration of mononuclear by Ficoll Hypaque .
9. Breeding of animals by different Routes.
10. Blood Group Antigen.
11. Specific primer designing
12. Extraction of nucleic acids (DNA & RNA) & Proteins
13. Primer designing.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester I  
Paper III

**Core BT PG 103. MOLECULAR ENDOCRINOLOGY  
AND REPRODUCTIVE TECHNOLOGY**

UNIT -1 :

1. Definition and scope of molecular Endocrinology .
2. Chemical nature of Hormones.
3. Purification and characterization of Hormones.
4. Production of Hormones by DNA technology.
5. Neurohormons as neural messengers
6. Mechanism of hormones production

UNIT - 2

1. Hormones receptors – Identification, quantitation, purification, and physico-chemical properties.
2. Membrane receptors Structure and signal transduction mechanism .
3. Nuclear receptors –Structure and function, orphan receptors .
4. Eicosonoids and Harmon action.
5. Concentration and transport of hormone in blood.
6. Hormones and aging

UNIT - 3

1. Contraception.
2. Multiple ovulation and embryo transfer technology.
3. Study of estrus cycle by vaginal smear technique.
4. Surgical technique – castration , ovariectomy ,vasectomy, tubectomy and laprotomy.
5. Extraction and estimation of Pregnanediol from urine.
6. Extraction of gonadotropins

UNIT - 4

1. Sex determination.
2. Embryo sexing and cloning
3. Genetic analysis of hormonal disorders
4. Transcriptional and post Transcriptional regulation of Hormones .
5. Hormonal regulation of continuous breeders
6. Hormonal regulation of seasonal breeders

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**REFERENCE BOOKS :**

1. Benjamin Lewin – Genes VII / VIII, oxford University press.
2. Lodish etal – Molecular Cell Biology .
3. Ethan Bier – The coiled spring Harbor press.
4. Freedman L.P., Molecular biology of steroid and nuclear hormone receptors.
5. Litwack, G. – Biochemical action of Hormones , Academic press.
6. Zarrow , M.X. yochin J.M. and Machrthy , J.L. – Experimental endocrinology.
7. Chatterjee C.C. – Human Physiology (vol.II )
8. Bentley , P.J.- Comparative Vertebrate endocrinology.
9. Hadley Mac.E. – Endocrinology.
10. Greenstein ,B. – Endocrine at a glance.
11. Puri C.P. and varlook , P.R. – Current concepts of fertility regulation and reproduction .
12. Austin ,C.R. and frshort ,R.V. – Reproduction in mammal.
13. Chinoy,N.J.Rao,M.V., Desaraj ,K.J. and High Land ,H.N. –Essential Techniques.
14. Jubiz, W. – Endocrinology: A logical approach for clinicians.
15. Horrobin,D,F. Essantial biochemistry ,Endocrinology and nutrition.
16. Norris,D.O. – Vertebrate Endocrinology.
17. Austen, C.R. and short ,R.V. –Reproduction in animals .
18. Edwards, R.G. – Human Reproduction.

**PRACTICAL EXERCISES :**

1. Bioassay of any hormone involving target tissue growth / differentiation.
2. Radioreceptor assay for any hormone .
3. RIA and ELISA for any hormone or second messenger.
4. Purification of any protein hormone .
5. Assay of steroid dehydrogenase.
6. Isolation and characterization of steroid / prostaglandin .
7. Gel retardation assay for transcription like protein .
8. Assay for protein phosphorylation c AMP dependent protein – Kinase.
9. Guanylcyclase assay in vitro.
10. Histological studies of endocrine gland.
11. Cytological studies of endocrine gland.
12. Histochemical studies of endocrine gland.
13. Study of vaginal histological during estrus cycle.
14. Demonstration of estrus cycle study by vaginal smear technique .

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Revised Syllabus only for SS in Zoology & Biotechnology for 2018-20 Session

15. Histological demonstration of glycogen during reproductive cycle and pregnancy.
16. Effect of testosterone, estradiol and progesterone.
  - (a) Male reproductive study by Weight/ volume Measurement .
  - (b) Female reproductive structure by Weight/ volume Measurement
17. Study of accessory reproductive structure after castration or ovariectomy
18. Sperm count .
19. Demonstration of surgical techniques.
  - (a) castration (b) Ovariectomy (c) Laparotomy (d) Parabiosis (e) vasectomy (f) tubectomy etc.
20. Demonstration of perfusion technique for the fixation of endocrine tissue.
21. Implantation of endocrine gland / tissue.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester I  
Paper IV

**Core BT PG 104. MICROBIOLOGY**

**UNIT - 1**

1. Pure culture techniques and preservation methods.
2. Preparation of Culture media, microbial staining.
3. Sterilization: Physical and chemical methods.
4. Bacterial growth curve and their mathematical expression.
5. Measurement of growth and factors affecting growth.
6. Nutritional classification of Microorganisms,

**UNIT - 2**

1. Isolation, types and cultivation of virus.
2. Replication of virus
3. Life cycle of DNA Viruses
4. Retroviruses.
5. Structure and morphology of Bacteriophage
6. Lytic and lysogenic cycle.

**UNIT - 3**

1. Cyanobacteria: General account and their importance.
2. Type of Infection, Mechanism of pathogenecity.
3. Bacterial Diseases: Staphylococcal and Salmonellosis Shigellosis.
4. Fungal Diseases, Histoplasmosis.
5. Viral Diseases: Chicken Pox, Hepatitis B.
6. Waterborne Disease: cholera.

**UNIT - 4**

1. Mycoplasma and diseases caused by them.
2. Bacterial Recombination : Transformation, Transduction
3. Plasmids and transposons.
4. Chemotherapeutic agents: Classification of antibiotics, Broad spectrum antibiotics.
5. Symbiosis: types of symbiosis, function and examples of commensalism.
6. Anti- fungal and antiviral antibiotic.

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**PRACTICAL EXERCISES:**

1. Preparation of liquid and solid media for growth of microorganisms.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution methods. Slants and stab cultures. Storage of Microorganisms.
3. Isolation of pure cultures from soil and water.
4. Growth; Growth curve; Measurement of bacteria population by turbidometry and serial dilution methods. Effect of temperature, pH and carbon and nitrogen sources on growth.
5. Microscopic examination of bacteria, Yeast and molds and study of organism by gram stain, Acid fast stain and staining for spores.
6. Study of mutation by Ames test.
7. Assay of antibiotics and demonstration of antibiotic resistance.
8. Analysis of water for potability and determination of MPN.
9. Biochemical characterizations of selected microbes.

**REFERENCE BOOKS**

1. General Microbiology, R.Y.Ingraham , J.L.Wheelis, M.L.and Painter, P.R. the MacMillan Press Ltd.
2. Brock Biology of Microorganism , M.T.,Martinko, J.M.and Parker, J.Prentic Hall.
3. Microbiology, Pelzer,M.J., chan , E.C.S. and Kreig ,N.R. Tata McGraw Hill.
4. Microbial Genetics , Maloy ,s.R., Cronan, J.E. Jr and Freifelder, D.Jones, Bartlett Pub.
5. Microbiology- A laboratory Manual, cappuccino , J.G. and Sherman , N. Addison Weseley.
6. Microbiological Application , ( A laboratory Manual in general Microbiology) Benson , H.J.WCB: Wm C. Brown Publishers.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology Semester I  
Practical based on paper 101-104

Total marks 16+24 = 40

(A) INTERNAL EXAMINATION 16 Marks

Exercise:

- |   |         |
|---|---------|
| 1. Practical Record   | 6 Marks |
| 2. <i>Viva-voce</i> / Oral test                                 | 6 Marks |
| 3. Preparation of culture media for the growth of microorganism | 2 Marks |
| 4. Determination of blood group in sample                       | 2 Marks |

(B) UNIVERSITY EXAMINATION 24 Marks

- |   |    |
|---|----|
| 1. Identify the fungus present in the given soil sample.  | 02 |
| 2. Study the morphology of given bacterial culture using Gram staining.   | 02 |
| 3. Separate the Amino acids in the mixture provided by paper chromatography.  | 02 |
| 4. Identify and comment upon given spots related to the following:<br>Endocrinology, Cytology-Cytogenetic and Immunology. | 10 |
| 5. Squash given root tips, observe and report ' <i>Mitotic index</i> '.   | 02 |
| 6. Squash given anther, observe and report Stages of ' <i>Meiosis</i> '   | 02 |
| 7. Demonstrate ' <i>Bar-body</i> ' if present in your own buccal cells.   | 02 |
| 8. Demonstrate ' <i>Mitochondrial</i> ' using vital stain.  | 02 |

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Total Marks 40 (16+24)

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20  
M.Sc. Biotechnology  
Semester II  
Paper I

Core BT PG 201. ENZYME TECHNOLOGY

UNIT-1

1. Enzyme: Enzyme classification & Nomenclature, EC number
2. Mechanism of enzyme catalysis: Acid-Base catalysis.
3. Mechanism of enzyme catalysis: Metal ion catalysis.
4. Enzymes: Active sites, Substrate specificity
5. Regulation of enzyme action.

UNIT-2

1. Enzyme Kinetics: The Michaelis-Menten equation
2. Analysis of Kinetic data (Determination of  $V_{max}$ , Lineweaver-Burk plot)
3. Enzyme regulation: Reversible Inhibition, Irreversible Inhibition
4. Allosteric Regulation
5. Enzyme Purification; Ion-exchange chromatography, Gel filtration chromatography, Affinity chromatography
6. Nontraditional enzymes

UNIT-3

1. Characterization of purified enzymes: X-ray crystallography, Mass Spectroscopy
2. Enzyme in medical diagnosis
3. Enzyme therapy
4. Enzyme disorders in human diseases.
5. Biological roles of enzymes
6. Use of enzymes in solution

UNIT-4

1. Enzyme stability
2. Enzyme Immobilization: - Techniques of immobilization, experimental Procedures of immobilization
3. Effect of immobilization on enzyme activity.
4. Industrial Application of immobilized enzyme .
5. Biosensors
6. Enzyme reactors

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**PRACTICAL EXERCISES:**

1. Protein estimation methods: Lowry, Bradford and Spectrophotometric.
2. Urease estimation in plant tissues.
3. Assay of acid phosphatase .
4. Assay of Alkaline phosphatase .
5. Determination of optimum pH, .
6. Determination of Km value.
7. assay of enzyme activity and Acetylcholinesterase estimation
8. Enzyme purification: Ammonium sulphate precipitation, Ion exchange chromatography, Molecular sieve chromatography .
9. Checking of purity of enzyme by chromatography.
10. Molecular Weight determination of enzyme by electrophoresis
11. Sub- cellular fractionation of enzymes and assays

**REFERENCE BOOKS**

1. The nature of Enzymology by R.L. Foster.
2. Enzymes by Dixon and Webb.
3. Fundamental of Enzymology by Pric and Stevens.
4. Enzyme Catalysis and Regulation by Hammes.
5. Enzyme Reaction Mechanism by Walsch.
6. The Enzyme vol. I & II by Boyer.
7. Enzyme Structure and Mechanism by Alan Fersht.
8. Enzyme Assays: A Practical Approach by Eisenthal and Danson.
9. Enzyme Biotechnology G.Tripathi.
10. Practical Biochemistry by Plummer.
11. Practical Biochemistry by Sawhney and R. Singh.
12. Biotechnology – A new industrial revolution by steve prentis

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M.Sc. Biotechnology  
Semester II  
Paper II

Core BT PG 202 ENVIRONMENTAL BIOTECHNOLOGY

UNIT - 1

1. Introduction to Environmental pollution.
2. Measurements of Environmental pollution.
3. Air pollution technologies: Biofilters & Bioscrubbers for treatment of Industrial waste.
4. Management of solid waste.
5. Bioreporter gene technology.
6. Biotechnology for enhanced oil recovery.

UNIT - 2

1. Definition and types of waste water.
2. Major contaminants in waste water.
3. Concept of ETP.
4. Physical methods of waste water treatment.
5. Chemical methods of waste water treatment.
6. Biological methods of waste water treatment.

UNIT - 3

1. Bioremediation: Types of Bioremediation.
2. Types of reaction in bioremediation, factors affecting Bioremediation.
3. Degradation of xenobiotics in environment.
4. Biofuels: Bioethanol, Biodiesel, Biohydrogen.
5. Biofertilizers.
6. Biopesticides.

UNIT - 4

1. Parameters and standards of noise, air, water : Significance of Various parameters, Standard adopted by CPCB & WHO.
2. Bioindicators of aquatic pollution.
3. Biosensors.
4. Integrated pest management
5. Biopolymer production and Bioplastic.
6. Vermicomposting.

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**PRACTICAL EXERCISES:**

1. Determination of pH in the given water sample
2. Determination of DO in the given water sample
3. Determination of Cl in the given water sample
4. Determination of BOD in the given water sample
5. Determination of Hardness in the given water sample
6. Determination of CO<sub>2</sub> in the given water sample

**REFERENCE BOOKS**

1. Environmental Biotechnology by Dr. Hans Soachim Jordning, Prof. Dr. Joseph Winter
2. Environmental Biotechnology by Lawrence K. Wang, Joo-Haw Tay, Volodymyr
3. Environmental Biotechnology by Geetha Bali
4. Environmental Biotechnology by Arvind Kumar
5. Environmental Biotechnology: Theory & Application By Evans, Greeth M., Furlong, Judith C.
6. Environmental Biotechnology: Advancement in water & waste water: By Z.Ujang, M. Henze
7. Text book of Environmental Biotechnology: by Vinod Soni, Vinay Sharma
8. Environmental Biotechnology: Principal & Applications By Bruce Rittmann & Perry McCarty
9. Environmental Biotechnology: Concept & Application By Soachim Jordning, Prof. Dr. Joseph Winter

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School of Studies in Zoology & Biotechnology,  
Session 2018-20  
M.Sc. Biotechnology  
Semester II  
Paper III

Core BT PG 203 BIOMOLECULES AND METABOLISM

Unit 1

1. Chromatographical methods of Protein Purifications
2. Electrophoretic methods of separation of proteins, differential centrifugation and ultracentrifugation techniques for proteins separation.
3. Primary structure determination of proteins: sequencing and detection of sequenced proteins.
4. Secondary structure of proteins: alpha helix and beta sheet structures, turns and loops.
5. Tertiary structures of proteins: super secondary structures, domains
6. Quaternary structures of proteins

Unit 2

1. Fractionation and isolation of nucleic acids
2. Structure of DNA
3. Biosynthesis of purine ribonucleotides, synthesis of purine deoxy-ribonucleotides.
4. Methods of salvage of purine Biosynthesis
5. Biosynthesis of pyrimidine, synthesis of pyrimidine deoxy-ribonucleotides.
6. DNA methylation.

Unit 3

1. Transcription factors, importance of transcription factors in gene expression.
2. DNA denaturation, renaturation and DNA damage.
3. DNA repair: base excision repair, nucleotide excision repair, mismatch repair, error-pron repair.
4. Transport through membranes, Passive mediated transport, active transport
5. Energy rich bonds: High energy compounds, coupled reactions involving ATP
6. Lipid metabolism: Pathways of Beta-oxidation of fatty acids

Unit 4

1. Pathway of Glycolysis
2. Pathway of Tricarboxylic acid cycle.
3. Pathway of Respiratory chain complexes and electron transport system
4. Oxidative phosphorylation and ATP synthesis.
5. Reactive oxygen species and oxidative stress
6. Reactive nitrogen species and its role in diseases

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**Practical**

1. Preparation of Standard curve of proteins, carbohydrate and lipids.
2. Estimation of total proteins, carbohydrates and lipids.
3. Estimation of nucleic acids.
4. Differential centrifugation and fractionation of subcellular organelles.
5. Assay of enzymes activity and determination of enzyme kinetics.
6. Fractionation of mitochondria and determination of ATPase activity in mitochondria.
7. Paper chromatography, thin layer chromatography, separation of amino acids, lipids and phospholipids.
8. Electrophoresis, separation of proteins.
9. Validation of Beer's Lambert Law
10. Determination of Absorption maxima

**Reference Books**

1. Fundamentals of Biochemistry 3<sup>rd</sup> edition by D. Voet, JG Voet, CW. Pratt, John Wiley & Sons
2. Principles of Biochemistry 5<sup>th</sup> edition by Nelson, Cox and Lehinger, WH Freeman & Company
3. Molecular Cell Biology by Lodish, Berk, Kaiser, Kreiger, Scott, Zipursky, Darnell
4. Biochemistry with clinical correlations by TJ Devlin, Wiley Leiss
5. Biochemistry by Zubey, Macmilan Publishing Company, New York
6. Biochemistry by CK Mathews, KE Van Holde, the Benjamin Cummings Publishing Company, Melano Park.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester II  
Paper IV

**Core BT PG 204 BIOINSTRUMENTATION**

**UNIT - 1**

1. Photometry: Basic principal of colorimetry.
2. UV- visible spectrophotometry: Principle, instrumentation and applications.
3. IR- spectrophotometry: Principle, instrumentation and applications.
4. Atomic absorption Spectroscopy: Principle, instrumentation and applications.
5. Mass Spectroscopy: Principle and application.
6. Fluorescence Spectroscopy: Principle, instrumentation and applications.

**UNIT - 2**

1. Chromatography: Paper and Thin layer Chromatography.
2. Gel filtration Chromatography and Ion Exchange Chromatography..
3. Gas-liquid chromatography and HPLC.
4. Electrophoresis: paper electrophoresis, agarose, Polyacrylamide Gel electrophoresis.
5. SDS - PAGE electrophoresis.
6. Isoelectric focusing.

**UNIT - 3**

1. X-ray crystallography.
2. NMR: Principle, Instrumentation and applications.
3. Nephelometry and Turbidimetry.
4. Centrifugation: Principle, Instrumentation and applications.
5. Ultrasonication: Principle, Instrumentation and applications.
6. Microtomy, types, principals and applications.

**UNIT - 4**

1. Microscopy : Light, Phase contrast , fluorescence Microscopies.
2. Electron Microscopy
3. Newer Technique in Microscopy: Confocal Microscopy.
4. Radioactivity Liquid, Scintillation Counter, solid Scintillation counters.
5. Radio Immuno Assay (RIA)
6. Autoradiography: Principle and applications.

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**PRACTICAL EXERCISES:**

1. Verification Beer's Law
2. Determination of absorption maxima
3. Electrophoresis of Proteins – native and under denaturing conditions.
4. Amino acid and carbohydrate separation by paper & thin layer chromatography.
5. Gas chromatography
6. Ion exchange and gel filtration chromatography.
7. Separation of sub-cellular organelles by differential centrifugation
8. Separation of blood cells by density gradient centrifugation.

**REFERENCE BOOKS**

1. Physical Biochemistry : Applications to Biochemistry and molecular Biology by freifelder
2. Biochemical techniques : Theory and Practice by Robyet and White
3. Principals of Instrumental Analysis by Skoog and West.
4. Analytical Biochemistry by Holme and Peck
5. Biological Spectroscopy by Campbell and Dwek
6. Organic Spectroscopy by Kemp
7. A Biologist's Guide to principles and Techniques of practical Biochemistry by Willson and Goulding.
8. Principles of Instrumental Analysis by Skoog , Hollar And Nicman.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology Semester II  
Practical based on paper 201-204

Total marks 16+24 = 40

(A) INTERNAL EXAMINATION

16 Marks

Exercise:

- |  |         |
|--|---------|
| 1. Practical Record  | 6 Marks |
| 2. <i>Viva-voce</i> / Oral test  | 6 Marks |
| 3. Demonstrate the microbial production of H <sub>2</sub> O <sub>2</sub> | 4 Marks |

(B) UNIVERSITY EXAMINATION

24 Marks

- |  |          |
|--|----------|
| 1. Demonstrate the starch hydrolysis by given bacterial culture      | 2 marks  |
| 2. Immobilization of plant pigment chlorophyll                       | 3 marks  |
| 3. Estimation of chloride in given water sample                      | 3 marks  |
| 4. Estimation of hardness in given water sample                      | 3 marks  |
| 5. Estimation of D.O. in given water sample                          | 3 marks  |
| 6. Spots based on environmental biotechnology and Bioinstrumentation | 10 marks |

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Total Marks 40 (16+24)  
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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20  
M.Sc. Biotechnology  
Semester III  
Paper I

Core BT PG 301 GENETIC ENGINEERING

Unit – 1

1. Restriction Endonucleases
2. DNA polymerases and ligase.
3. Cloning vectors : plasmids, bacteriophages
4. Plasmid vectors: Cosmids and artificial chromosomal vectors, retroviral vectors, expression vectors.
5. Gene cloning strategies: cDNA and genomic cloning.
6. Construction of genomic and cDNA libraries.

Unit – 2

1. DNA sequencing: Maxam and Gilbert method; using bacteriophage M13 method.
2. Site directed Mutagenesis: oligonucleotide- directed mutagenesis, PCR- amplified mutagenesis.
3. Methods of gene transfer in eukaryotic cells.
4. Gene knockouts and creation of knockout mice.
5. Gene Expression Analysis.
6. Types of PCR and PCR methods for DNA amplification.

Unit-3

1. Methods of Primer designing and Gene construction.
2. Ex vivo Gene therapy for Genetic disorders:
3. In vivo Gene therapy for genetic disorders.
4. Molecular Diagnosis of Genetic Diseases.
5. Principles and applications of gene silencing SiRNA technology.
6. Micro- RNA (miRNA) technology for gene silencing.

Unit-4

1. Restriction fragment length polymorphism (RFLP)
2. Method and applications of DNA fingerprinting.
3. Principals and methods of Fluorescence in situ hybridization (FISH)
4. Ethical Issues in Biotechnology
5. Bio safety Measures and Regulations for Genetically Engineered Products.
6. Patenting biotechnological products.

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**PRACTICAL EXERCISES:-**

1. Bacterial Culture and Preparation of competent cells
2. Isolation of plasmid DNA
3. Quantitation of nucleic acids
4. Restriction mapping of plasmid DNA
5. Preparation of single stranded DNA template
6. Gene expression in E. coli and analysis of gene product
7. Transfection.
8. Purification & Quantitation of RNA.
9. Protein Analysis
10. Restriction Mapping
11. Bacterial Transformation.
12. Recombinant Protein Purification and Analysis.
13. Plasmid DNA preparation, Restriction Enzyme Digestion and cloning.

**REFERENCE BOOKS :-**

1. Recombinant DNA – By Watson et al
2. Principles of Gene Manipulation, old and Primrose
3. Gene Cloning: An introduction, Brown
4. Biotechnology : Theory and Techniques ( Vol I& II, 1995), Chirikjian
5. Molecular Genetics of Bacteria, Dale
6. Molecular Cloning ( Vol I,II & III, 2001), Sambrook & Russell
7. Applied Molecular Genetics ( 1999), Miesfeld
8. Genes and Genome (1991) , Singer & Berg
9. Molecular Biotechnology , Glick & Pasternak
10. Plant Molecular Biology (vol. I 7 II ,2002 ), Glimartin & Bowler
11. Principles of Gene Manipulation and Genomics- Primrose and Twyman .
12. Concept of Genetics – William S. Klug, Michal R. Commings.
13. Molecular Biotechnology – Bernarl R. Glick , Jack j. Pasternak.
14. Genome – T.A. Brown
15. Biotechnology – A laboratory Course- Jeffrey M.Beckes, Guy A. Caldwell, Eue Ann Zachgo

*Note* : All text books are of latest editions:

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester III  
Paper II

**Core BT PG 302 BIOPROCESS ENGINEERING AND BIOINFORMATICS**

**Unit-1**

- 1- Isolation, screening and maintenance of industrially important microbes.
- 2- Strain improvement for increased yield and other desirable characteristics.
- 3- Bioreactor design: General design information and types of Bioreactors.
- 4- Fermentation-Basic concept of fermentation, its types and applications of fermentation.
- 5- Production of Lactic acid.
- 6- Production of Vinegar.

**Unit-2**

- 1- Production of Amino acid (Lysine) and Insulin
- 2- Production of Antibiotics (Streptomycin).
- 3- Production of Protease Enzyme.
- 4- Bioprocess Operations: Upstream processing: Sterilization, Aeration, agitation.
- 5- Downstream processing: Biomass Removal and Disruption Techniques: Physical, Chemical and Enzymatic Methods.
- 6- Downstream processing: Filtration, centrifugation, sedimentation and flocculation method of bioseparation of fermentation products; Drying, crystallization of fermentation products.

**Unit-3**

- 1- Aim and Tasks of Bioinformatics and their Applications.
- 2- Biological Databases: Proteins and nucleic acid Databases.
- 3- Introduction to NCBI, EBI.
- 4- Search Tool: Basic Local Alignment tool (BLAST) and FASTA.
- 5- Pair wise Alignment Technique.
- 6- Multiple Sequence Alignment Technique.

**Unit-4**

- 1- Submitting DNA sequences to the databases.
- 2- Submitting Protein sequences to the databases.
- 3- Human Genome Project.
- 4- Using BLAST for Gene discovery.
- 5- Molecular Phylogenetics: Introduction and Historical information.

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## Revised Syllabus only for SS in Zoology & Biotechnology for 2018-20 Session

### 6- Phylogenetic Analysis methods.

#### PRACTICAL EXERCISES :-

1. Various Immobilization techniques of cells, enzymes, use of alginate for cell Immobilization.
2. Microbial production & downstream processing of an enzyme eg. Amylase.
3. Studying the kinetics of enzymatic reaction
4. Alignment algorithms
5. Sequence based methods of structure prediction
6. Scoring techniques.
7. Sequence sequence scoring
8. Submitting DNA sequence to the database & database searching
9. Sequence alignments : Pair wise alignment techniques, Multiple sequence Alignment
10. Primer designing
11. Searching MEDLINE, pubmed, current contents, Science citation index , electronic journals. grants & funding information

#### REFERENCE BOOKS :-

1. Jakson AT, Bioprocess engineering in Biotechnology, Prentice Hall , Engelwood cliffs,1991
2. Shuler ML & Kargif, Bioprocess engineering : Basic concepts, 2<sup>nd</sup> edition, prentical Hall, Enngelwood cliffs,2002
3. Baily JE & Ollis DF, Biochemical engineering fundamentals, 2<sup>nd</sup> edition Mcgraw Hill Book Co., Newyork, 1986
4. Comprehensive Biotechnology: the principles, Applications & Regulation of Biotechnology in industry Agriculture & Medicine, Vol. 1,2,3,4, Young MM, Reed Elsevier India Privet. Ltd., India 2004
5. David W. Mount Bioinformatics: sequence & genome Analysis 2<sup>nd</sup> edition, CHSL, Press,2004
6. A. Baxevanis & F.B.F Ouellette, Bioinformatics: A practical guide to the analysis of genes & proteins , 2<sup>nd</sup> edition , John wiley, 2001
7. Jonathan Pevsner, Bioinformatics & functional genomics, 1<sup>st</sup> edition, Wiley Liss, 2003.
8. Scholar. Bioprocess Engineering.

Note : All text books are of latest editions:

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester III  
Paper III

**Core BT PG 303 INDUSTRIAL BIOTECHNOLOGY  
AND ANIMAL TISSUE CULTURE**

**Unit-1**

1. History Importance and applications of Industrial Biotechnology.
2. Genetic improvement of strains and methods of strain development.
3. Microbial production of Penicillins.
4. Microbial production of Vitamins & amino acids ( Vitamin B12)
5. Microbial production of enzymes (Amylase)
6. Operation of conventional Bioreactor

**Unit-2**

1. Microbial production of alcoholic beverages: Beer and Wines
2. Microbial production of organic acids (Citric acid)
3. Microbial production of solvents (Glycerol)
4. Microbial production of Amino acids (Glutamic acid)
5. Microbial production of food (cheese)
6. Microbial metabolic products.

**Unit-3**

1. Bio-transformation : Steroids and antibiotics
2. Single cell protein
3. Mushroom cultivation
4. Bioleaching
5. Microbial polysaccharides
6. Immobilization of microbial cell for product enhancement and their applications.

**Unit - 4**

1. Introduction and organization of animal cell and tissue culture laboratory
2. Primary and established cell line cultures
3. Culture media for animal cells
4. Basic techniques of mammalian cell culture : disaggregation of tissue
5. Scaling up of animal cell culture, Cell synchronization
6. Biology and characterization of the cultured cells measurement of parameters of growth.

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**PRACTICAL EXERCISES :- Industrial biotechnology**

1. Isolation of industrially important micro organisms for microbial processes
2. Microbial production of citric acid using *Aspergillus niger*.
3. Production and estimation of Alkaline Protease
4. Biomass SCP from fungi , algae
5. Organic solvent production
6. Bio- transformations
7. Bio – insecticide isolation, purification and assay
8. Bio- fertilizer production
9. Use of alginate for cell immobilization

**PRACTICAL EXERCISES :- Animal tissue culture**

1. Preparation of tissue culture medium and membrane filtration
2. Preparation of single cell suspension from spleen and thymus
3. Cell counting and viability
4. Macrophage monolayer from PEC and measurement of phagocytic activity
5. Cell fusion with PEG
6. Primary tissue explantation technique

**REFERENCE BOOKS:-**

1. Biochemical Engineering, Abia, S., Humphery, A.E. and millis, N.F. Univ. Tokyo Press, Tokyo.
2. Biochemical Reactors, Atkinson, B., pion Ltd. London.
3. Biochemical Engineering Fundamentals, Baily. J.E. and Ollis, D.F. Mcgraw- Hill Book Co. New York.
4. Bioprocess Technology: Fundamentals and Applications, KTH, Stockhlom.
5. Process Engineering in Biotechnology, Jackson, A.T., Prentice hall, Engelwood Cliffs.
6. Bioprocess Engineering: Basic concept Shuler, M.L. and Kargi, F., Prentice Hall Englewood Cliffs.
7. Principles of fermentation Technology, Stanbury, P.F. and Whitakar, A., Pergmon Press, Oxford.
8. Bioreaction Engineering principles, Nielson, J. and Viladsen, J., Plenum Press.
9. Chemical Engineering, Problems in Biotechnology, Shuler, M.L.(Ed.), AICHE.
10. Biochemical Engineering, Lee, J.M., Prentice Hall Inc.
11. Bioprocess Engineering – Kinetics, Mass Trasport, Reactors and Gene Expression, Veith W.F., John Wiley and Sons, Inc.
12. Culture of animal cells by RI Freshney.
13. Animal Cell culture practical approach John RW Masters.
14. Animal cell culture techniques by Ed. Martin Clynes.
15. Methods in Cell Biology Vol- 57, Animal cell culture methods.
16. Industrial Biotechnology by, A.H. Patel.
17. Fermentation by Casida.

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18. Animal Cell Culture & Technology. M.Buth

Note : All text books are of latest editions:

Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester III  
Paper IV  
Elective 1 BT PG 304 PLANT BIOTECHNOLOGY

**Unit – 1**

1. Introduction, History of plant tissue culture & its application, Tissue culture media preparation.
2. Callus culture and its maintenance, Suspension culture
3. Organogenesis, Somatic embryogenesis, micro propagation and its applications
4. Somatic hybridization: Methods & application;
5. Production of haploid (Anther culture and Ovary culture).
6. Cybridization, shoot tip culture.

**Unit – 2**

1. Protoplast isolation and fusion and its application.
2. Somaclonal variation and its application.
3. Germplasm conservation; cryopreservation and its application.
4. Generation of genetically modified crops for resistance against biotic stress: Viral resistance, bacterial resistance, fungal resistance..
5. Genetically resistance plants against Insect & pathogens resistance.
6. Regulatory sequences of induced gene.

**Unit-3**

1. Generation of genetically modified crops for resistance against abiotic stress: Herbicide resistance drought, salinity thermal stress.
2. Plant cloning vectors: TI plasmid.
3. Viral vectors ( CaMV based vectors, Gemini viruses, TMV based vectors).
4. Plant transformation: Agrobacterium mediated gene transfer & direct gene transfer.
5. Chloroplast transformation: Vectors, Markers, Methods, Advantages & limitations.
6. Transplastomic plants and its applications.

**Unit – 4**

1. Transgenic plant for edible vaccines, Antibodies.
2. Modification of plant nutritional content: Oil, starch amino acid & protein ( golden rice).
3. Transgenic plants for floriculture.
4. Transgenic plants for biopharmaceuticals.
5. Molecular markers & maps: RFLP & RAPD.
6. Plant breeders rights (PRPs) & farmer's rights.

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28

**PRACTICAL EXERCISES :-**

1. Preparation of media
2. Surface sterilization.
3. Organ Culture.
4. Callus propagation, organogenesis, transfer of plants to soil.
5. Protoplast isolation and culture.
6. Anther culture, production of haploids.
7. Agrobacterium culture, selection of transformants, receptor gene ( GUS) assays.
8. Genomic DNA isolation from seeds and plant tissues, electrophoretic analysis
9. Restriction digestion of plant genomic DNA
10. Setting up of PCR reactions.

**REFERENCE BOOKS:-**

1. Plant Biotechnology, Springer Verlag, 2000.J. Hammond,P. Mc.Garvey and V. Yusibov(Eds.)
2. Introduction to plant tissue culture by Kalyan Kumar
3. Plant tissue culture by Bhojwani
4. Practical applications of plant molecular biology by Henry et al
5. Principles of plant Biotechnology by Montell SH et al
6. Plant Genome analysis by PM Gresshoff
7. Essentials of plant breeding by Phundan Singh
8. Biotechnology: Theory and Techniques Vol. I & II by Jack Chirikjian
9. Genetic engineering by Sandhya Mitra
10. Plant Molecular Biology Vol I & II by Phillip M Gimartin & Chris Bowler
11. Plant tissue culture by Razdan
12. Agriculture Biotechnology by Purohit.

*Note* : All text books are of latest editions:

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39



Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology  
Semester III  
Paper IV

Elective 2 BT PG 304 GENOMICS AND PROTEOMICS

305

Unit: 1

1. The organization of nuclear DNA in eukaryotes:
2. Sequencing of genome.
3. Tools for genome analysis (RFLP, RAPD)
4. DNA fingerprinting
5. Transcription analysis using Northern blot, RNA dot blot, reverse transcriptase method.

Unit: 2

1. DNA Microarray technology
2. Normalization of microarray data
3. Polymerase chain Reaction
4. ESTs and SNPs
5. Human genome project
6. DNA sequencing

Unit: 3

1. Protein analysis using biochemical method.
2. Protein analysis using N – terminal sequencing and C- terminal Sequencing.
3. Protein expressing analysis using Isoelectricfocusing and peptide fingerprinting.
4. Protein characterization using multidimensional liquid chromatography and mass spectrophotometer
5. Protein microarray
6. Structural proteomics

Unit: 4

1. Analysis of protein structure using X – ray diffraction method.
2. Analysis of protein structure using Nuclear magnetic resonance spectroscopy.
3. Genomics based method for detection of Protein – Protein interaction.
4. Biochemical based methods for detection and Characterizing Protein- Protein interaction.

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5. PCR – directed protein in situ arrays
6. Situ directed mutagenesis method for sequence modification.

**PRACTICAL EXERCISES :-**

7. Preparation of cell free lysates.
8. Isolation & extraction of Proteins
9. Isolation & extraction of nucleic acid
10. Agarose/ Polyacrylanide gel electrophoresis

**REFERENCE BOOKS:-**

1. Voet D, Voet, J.M.- Fundamental of Biotechnology, Wiley, New York
2. Brown, TA. Genomics, Garland science
3. Campell, AM and Heyer, L.J., Discovering Genomics, Proteomics & Bioinformatics, Banjamen cummings.
4. Primrose, S, Principals of Gene manipulation and Genomics, Black well.
5. Glick, B R & Pasternak, JJ, Molecular Biotechnology, ASM Press.

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Vikram University, Ujjain  
School of Studies in Zoology & Biotechnology,  
Session 2018-20

M.Sc. Biotechnology Semester III  
Practical based on paper 301-304

Total marks 16+24 = 40

**(B) INTERNAL EXAMINATION** 16 Marks

Exercise:

1. Practical Record 6 Marks
2. *Viva-voce*/ Oral test 6 Marks
3. Report the forward and reverse primer of the given accession no.  
Accession No.: 4 Marks

**(B)UNIVERSITY EXIMINATION** 24 Marks

1. Find out the name and maximum score of the given accession  
no. /protein sequence Accession No.: 3 marks
2. Demonstrate the primary tissue explantation technique by  
single cover slip with plasma clot 3 marks
3. Isolation of snail embryo and identification of stage 3 marks
4. Immobilization of plant pigment chlorophyll 3 marks
5. Preparation of MS media 2 marks
6. Spots based on Industrial & plant Biotechnology 10 marks

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**Total Marks 40 (16+24)**  
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## Scheme of Examination 2018-2020

### M.Sc. Biotechnology Sem-IV CBCS

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Biotechnology of 2018-20 Academic session

Sl. No.	Course code	TITLE OF COURSE	Course type	MARKS			
				Internal examination marks	University examination marks	Total marks	Credits
1	BT 401	Project work/ Onsite training Project presentation Project Report Assessment <i>Viva Voce</i>	Core	100 Project work + Presentation	140 Project report Assessment + <i>Viva-Voce</i>	240	12
2	BT 402	Industrial visit/ Scientific Lab visit	Core	30 (Report)	50 ( <i>Viva-Voce</i> )	80	4
3	BT 403	Review writing	Core	30 (write up)	50 ( <i>Viva-Voce</i> )	80	4
4	BT 404	Seminar	Core	25 (write up)	35 Presentation	60	3
5	BT 405	Poster presentation	Core	25 Poster	35 Presentation	60	3
6	BT 406	Comprehensive <i>Viva-voce</i> (Virtual credits)	Core	-	80	80	4
Total Marks				210	390	600	30

Grand Total M.Sc. Biotechnology 2018-20

Marks: 2400

Credits: 120 (Each credit is equal 20 marks)

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