Department of English
Mahatma Gandhi University

Course Structure under the Reorganized CBCS (with effect from AY 2019-20)

Subject: English (First Language)

B.A. / B.Sc. /B.Com. and other UG Courses

Course Objectives

The 20-credit, six-semester course seeks to enhance the English language skills of undergraduate students by

- Strengthening their grammar and vocabulary
- Improving their reading and writing skills
- Enhancing their listening and speaking skills
- Imparting to them important life skills and human values
- Encouraging them to think creatively and critically
- Exposing them to a variety of content-rich texts
- Expanding their emotional intelligence
- Developing gender sensitivity among them.

Course Outcomes

On successful completion of the 20-credit, six-semester course, an undergraduate student will be able to

- Read, understand, interpret a variety of written texts
- Undertake guided and extended writing using appropriate vocabulary and correct grammar
- Listen with comprehension and speak with confidence in both formal and informal contexts with reasonable fluency and acceptable pronunciation
- Become employable with requisite professional skills, ethics and values.

Credits, Syllabus, and Instructional Hours

Semester	**Number of Credits**	**Number of Units**	**Instruction (Clock hours per week)**
I	4	4	4
II	4	4	4
III	3	3	3
IV	3	3	3
V	3	3	3
VI	3	3	3
Total	**20**	**20**	**20**

Reorganized CBCS
(With effect from AY 2019-20)

Subject: English (First Language)

Semesters I & II

Course Code:
Instruction: 4 clock hours per week
Credits: 4
Continuous Assessment: 20 Marks
University Examination: 80 Marks
Duration of University Examination: 3 Hours

Course Structure
Four equal units per semester integrating English language learning with ethics, values, and skill development.

The syllabus will include, but is not limited to, the following components:

Units	Components
I	**Reading and Vocabulary** Passages for language enrichment and personality development (including comprehension, interpretation, creative critical thinking, and empathy) **Writing and Grammar** (including Spelling and Punctuation) Guided writing, Sequencing, Paragraph, Descriptive writing, Dialogue writing, Note taking, Note making, Letter writing; Parts of speech, Tenses, Articles **Listening and Speaking** (including Conversation and Pronunciation) Self-introduction, Situation and Function-based conversations; English Speech Sounds (Vowels and Consonants) **Soft Skills and Values** Inculcating self-confidence, and effecting desirable attitudinal and behavioural changes.
II	
III	
IV	
V	
VI	
VII	
VIII	

Semesters III - VI

Course Code:
Credits: 3 per semester
Instruction: 3 clock hours per week
Continuous Assessment: 20 Marks
University Examination: 80 Marks
Duration of University Examination: 3 Hours

Course Structure
Three equal units per semester integrating English language learning with ethics, values, and skill development.

Two units (one each in Sem V and VI) will be designed to inculcate gender sensitivity. Appropriate course material will be prepared.

The syllabus will include, but is not limited to, the following components:

Unit	Components
I II III IV V VI VII VIII IX X XI XII	**Reading**: Fictional and Non-Fictional Prose, Poetry, and Drama for Comprehension, Interpretation, Literary Appreciation, Societal Awareness, Gender Sensitivity, Ecological Awareness, Constitutional Values. **Writing**: Process writing, Script writing, Personal Diary/journal writing, Essay Writing (different kinds), Report Writing (different kinds), CV Writing, Review/Article Writing. **Grammar**: Prepositions, Voice, Connectives, Reported Speech, Conditionals, Common Errors, Concord, Determiners, Degrees of comparison, Relative clauses, Framing questions, Transformation of sentences. **Vocabulary**: Synonyms, Antonyms, Anagrams, Acronyms, Rhyming words, Picture vocabulary, Indianisms, British-American English, Phrasal Verbs, Idioms, Technical Vocabulary, Commonly Confused Words.

In addition, the proposed syllabus of Semesters III-VI will impart, as in Semesters I and II, either directly or through the use of authentic materials, **communication skills** (formal and informal conversation skills, debating skills, interview skills etc), **study skills** (reference skills, library skills etc), **social skills** (politeness, patience, participation, cooperation, sharing etc), **soft skills** (such as negotiation, team work, decision making, beating the odds, dealing with failure etc), and **values** (such as honesty, empathy, fortitude, selflessness etc).

DEPARTMENT OF ENGLISH
MAHATMA GANDHI UNIVERSITY
NALGONDA
CBCS GENERAL ENGLISH SYLLABUS STRUCTURE FOR U.G. I YEAR

Prescribed General English Text Book for I Year (Sem -I &Sem -II) for B.A /B. Sc /B.Com and all other U.G. Courses
Title: English for Enhanced Competence Published by Orient Black swan
Editors: Prof. Sumita Roy, Prof. A. Karunakar and K. ArunaPriya

SEMESTER - I

UNIT - I(SHORT FICTION)	TEXT	**The Eyes are not Here - by Ruskin Bond**
	Pronunciation	Consonant Sounds
	Grammar	Nouns
	Vocabulary	Roots
	Spelling	Pick out the words which are wrongly spelt and correct them.
	Punctuation	Capitalization
	Conversation + Role Play	Introducing yourself in a formal or social context to the strangers
	Reading Passage	Historical place: Chayasomeshwaralayam (Nalgonda)
	Writing	Guided writing/expansion
	Soft Skills	Motivation and goal setting
	Value Orientation	Well begun is half done
UNIT - II (PROSE)	Text	**"Work Brings Solace" -Wings Of Fire - A.P.J. Abdul Kalam**
	Pronunciation	Vowel :Monophthongs
	Grammar	Pronoun
	Vocabulary	Prefix and suffix
	Spelling	Use 'Un' or 'dis' to complete the antonyms
	Punctuation	Capitalization
	Conversation + Role play	Starting a conversation/controlling a conversation
	Reading Passage	An important event of Telangana history: Telangana Formation Day
	Writing	Sequencing
	Soft skills	Self confidence
	Value Orientation	Doubt is the beginning of wisdom

UNIT - III (POETRY)	Text	**Bangle Sellers – Sarojini Naidu**
	Pronunciation	Vowel Diphthongs
	Grammar	Helping verbs
	Vocabulary	Homophones, homonyms, homographs
	Spelling	Complete the words using 'tion' on 'sion'
	Punctuation	Comma and full stop
	Conversation + role play	Describing your college and course of study
	Reading passage	A popular Telangana festival: Bathukamma Festival
	Writing	Paragraph/descriptive writing
	Soft skills	Body language/nonverbal communication
	Value orientation	Actions speak louder than words
UNIT - IV (DRAMA)	Text	**Merchant of Venice Act IV Scene –I William Shakespeare**
	Pronunciation	Varied pronunciation of some letters of the Alphabet
	Grammar	Main verbs and tenses
	Vocabulary	Collocation
	Spelling	Complete the following spellings using 'tion' or 'ment'
	Punctuation	Question mark and exclamation mark
	Conversation + Role play	Leaving a message on the answering maechine/ making an appointment on telephone
	Reading Passage	A famous tourist attraction in Nalgonda :Nagarjunsagar, Nalgonda
	Writing	Dialogue
	Soft skills	Inter personal skills
	Value Orientation	Faith will move mountains
SEMESTER - II		
UNIT - I (FICTION AND SHORT FICTION)	Text	**The Open Window – H.H.Munro (saki)**
	Pronunciation	Plosives
	Grammar	Nonfinite verbs
	Vocabulary	Simile and metaphor
	Spelling	Complete the following using 'ei' or 'ie'
	Punctuation	Semi colon
	Conversation + Role play	Asking for advice/ asking for information

	Reading Passage	Yagagirigutta: famous pilgrim place in Nalgonda
	Writing	Note Taking and Note Making
	Soft skills	Time Management
	Value Orientation	Time and tide wait for no one
UNIT - II (PROSE)	Text	**The voice of Humanity – Rabindranath Tagore**
	Pronunciation	Fricatives
	Grammar	Adjectives
	Vocabulary	Oxymoron and Hyperbole
	Spelling	Complete the following with 'able' or 'ible'
	Punctuation	Colon and Long dash
	Conversation + Role play	Making a request/ accepting or refusing the request
	Reading Passage	Rural Telangana: Devarakonda Fort history
	Writing	Informal letter
	Soft skills	Leadership skills
	Value Orientation	'The pen is mightier than the sword'
UNIT - III (POETRY)	Text	**If- by Rudyard Kipling**
	Pronunciation	Affricates and Nasals
	Grammar	Articles
	Vocabulary	Portmanteau words and loan words
	Spelling	Complete the following spellings using one of the following suffixes: '-ic', '-ive', '-ity', '-al', '-ance', '-ence'
	Punctuation	Hyphen and Long dash
	Conversation + Role play	Conducting a meeting/seeking opinion of the team members
	Reading Passage	Cultural Identity of Telangana:Telangana Ballads
	Writing	Formal letter
	Soft skills	Stress management
	Value Orientation	Practice makes one perfect
UNIT - IV (DRAMA)	Text	**Riders to the Sea by J.M.Synge**
	Pronunciation	Lateral, frictionless continuants, semi vowels
	Grammar	Adverbs
	Vocabulary	palindromes
	Spelling	Complete the spellings in the following table Noun | Verb | Adjective | Adverb
	Punctuation	Inverted commas

	Conversation + Role play	Appearing for a job interview/conducting a job interview
	Reading Passage	Handicrafts of Telangana : Pochampally
	Writing	Business letter
	Soft skills	Etiquette and Grooming
	Value Orientation	Necessarily is the Mother of invention

Testing Pattern in the Reorganized CBCS
(With effect from AY 2019-20)

Subject: English (First Language)

B.A. /B.Sc. /B.Com. and other U.G. Courses

Semesters I & II

I Internal Assessment: 20 marks

II End-Semester Exam: 80 marks

- Section I: 6 short answer Qs to be set. 4 to be answered.
  4 x 5 marks each = 20 marks
- Section II: 4 long answer Qs with internal choice to be set.
  4 x 15 marks each = 60 marks

Note: Questions should cover all units:

- In Section I, Q 1 to be based on Unit I, Q 2 on Unit II and so on.

In Section II, Q 7 A & B to be based on Unit I, Q 8 A & B to be based on Unit II and so on.

Department of English
Mahatma Gandhi University

Course Structure under the Reorganized CBCS
(with effect from AY 2020-21)

Subject: English (First Language)

B.A. / B.Sc. / B. Com. and other U.G. Courses

Course Objectives

The 20-credit, six-semester course seeks to enhance the English language skills of undergraduate students by

- Strengthening their grammar and vocabulary
- Improving their reading and writing skills
- Enhancing their listening and speaking skills
- Imparting to them important life skills and human values
- Encouraging them to think creatively and critically
- Exposing them to a variety of content-rich texts
- Expanding their emotional intelligence
- Developing gender sensitivity among them.

Course Outcomes

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- Read, understand, interpret a variety of written texts
- Undertake guided and extended writing using appropriate vocabulary and correct grammar
- Listen with comprehension and speak with confidence in both formal and informal contexts with reasonable fluency and acceptable pronunciation
- Become employable with requisite professional skills, ethics and values.

Credits, Syllabus, and Instructional Hours

Semester	**Number of Credits**	**Number of Units**	**Instruction (Clock hours per week)**
I	4	4	4
II	4	4	4
III	3	3	3
IV	3	3	3
V	3	3	3
VI	3	3	3
Total	**20**	**20**	**20**

Department of English
Mahatma Gandhi University
Semesters III & IV

Course Code:

Instruction: **3 clock hours per week**
Credits: **3**
Continuous Assessment: **20 Marks**
University Examination: **80 Marks**
Duration of University Examination: **3 Hours**

Course Structure:

Three equal units per semester integrating English language learning with ethics, values, and skill development.

The syllabus will include, but is not limited to, the following components:

Unit	Components
I	**Reading**: Fictional and Non-Fictional Prose, Poetry, and Drama for Comprehension, Interpretation, Literary Appreciation, and Awareness about Contemporary Issues.
II	**Writing**: Essay Writing (different kinds), Report Writing (different kinds), CV Writing, Review/Article Writing.
III	**Grammar**: Prepositions, Voice, Connectives, Reported Speech, Conditionals, Common Errors.
IV	**Vocabulary**: Phrasal Verbs, Idioms, Technical Vocabulary, Commonly Confused Words.
V	
VI	

Department of English
Mahatma Gandhi University
CBCS General English Syllabus

Semesters III & IV
(2020-21)
Prescribed General English Text Book for II Year (Semester -III & Semester-IV)
Title: English for Enhanced Competence-II Published by Orient Black Swan
Editors: Prof. A. Karunakar and K. Aruna Priya

Semester III

3 Credits **3 hrs. of Instruction per week**

Unit- I Short Fiction

Text **The Man Who Saved Pumpelsdrop by W. J. Turner**

Pronunciation	Plural endings and past tense endings
Grammar	Preposition
Vocabulary	Anagrams
Spelling	Difficult words
Punctuation	Capitalization
Conversation	An argument between two/three people about the right way to approach life
Reading	Kasoj Srikanta Chary – Telangana Martyr
Writing	Narrative writing/narrative essay
Soft Skills	Negotiation
Value Education	Hope for the best, but prepare for the worst

Unit-II Prose

Text **On the Pleasures of No Longer Being Very Young by G.K. Chesterton**

Pronunciation	Syllable
Grammar	Conjunction
Vocabulary	Phrasal verbs
Spelling	Irregular verbs
Punctuation	Comma
Conversation	Friends sharing the experience of being caught in embarrassing situations
Reading	Raavi Narayana Reddy - Freedom Fighter- Son of Nalgonda
Writing	Debate writing/ argumentative essay
Soft Skills	Decision making
Value Education	Better late than never

Unit – III Poetry

Text **An Irish Airman Foresees his Death by W.B Yeats**

Pronunciation	Consonant cluster
Grammar	Active and passive voice
Vocabulary	Idioms
Spelling	Irregular verbs past tense
Punctuation	Full stop
Conversation	Learning to open an account in a bank and net banking
Reading	Munagala Kondala Rao - "Deverakonda Gandhi"
Writing	Rhyming couplets
Soft Skills	Problem solving
Value Education	Early bird catches the worm

Semester IV

3 Credits **3 hrs. of Instruction per week**

UNIT I (DRAMA)

Text **With the Photographer by Stephen Leacock**

Pronunciation	Word stress—Prefix
Grammar	Direct and Indirect speech
Vocabulary	Eponyms
Spelling	Words commonly used in cinema, TV, media
Punctuation	15 lines of drama/dialogue for punctuation
Conversation	5 friends discussing their unique hobbies
Reading	Aarutla Kamala Devi –Women Freedom fighter
Writing	Personal Diary/journal writing
Soft Skills	Team work
Value Education	God helps those who help themselves

UNIT II (letter)

Text **Letter from a Father to a Daughter by Jawaharlal Nehru**

Pronunciation	Word stress—suffix
Grammar	Change of degrees of comparison
Vocabulary	Words often confused
Spelling	Silent letter words
Punctuation	Short fiction passage with mistakes in punctuation for correction/editing
Conversation	How people behave when unexpected/unwelcome guests arrive
Reading	Uppala Malsoor – A Man of Soil
Writing	Expository essay
Soft Skills	Emotional intelligence
Value Education	Actions speak louder than words

UNIT III (SHORT FICTION)

Text **How Wealth Accumulates and Men Decay by G.B. Shaw**

Pronunciation	Contractions
Grammar	7 types/ structures of sentences
Vocabulary	Alliteration, rhyming words
Spelling	Doubling of consonants
Punctuation	Short prose passage with mistakes in punctuation for correction/editing
Conversation	A group of students share the experience of visiting different places during their vacation
Reading	Fluorosis – A curse to Nalgonda
Writing	Article for a magazine/newspaper
Soft Skills	Critical thinking
Value Education	There is no time like the present

Department of English
Mahatma Gandhi University
Testing Pattern in the Revised CBCS
Subject: English (First Language)
(With effect from AY 2020-21)

B.A. / B.Sc. / B. Com. and other U. G. Courses

Semesters III and IV

I - Internal Assessment: 20 marks

II End-Semester Exam: 80 marks

Note: The Question Paper Pattern will be uploaded a little later

C.B.C.S PATTERN SYLLABUS FROM 2019 ON WARDS.

B.A., B.SC., B.COM & B.B.A 1ST SEMESTER TELUGU (11nd LANGUAGE)

Unit. No. I ప్రాచీన కవిత్వం

1. శకుంతలోపాఖ్యానం- నన్నయ
2. గొడగూచి కథ- పాల్కురికిసోమన
3 సంపరణునితపస్సు- అద్దంకిగంగాధరకవి.

Unit. No. II ఆధునిక కవిత్వం

1. కాసులు- గురజాడ అప్పారావు
2. రాజు - కవి- గుర్రంజాషువా
3. గంగిరెద్దు- పల్లాదుర్గయ్య
4. జయభేరి- శ్రీశ్రీ

Unit. No. III ఉపవాచకం

రుద్రమదేవి (నవల) -ఒద్దిరాజుసోదరులు

Unit. No. IV వ్యాకరణం

పర్యాయ పదాలు , నానార్థాలు, సంధులు సమాసాలు, తెలుగు వాక్యం

పాఠ్యగ్రంథం: తెలుగు అకాడమీ వారి సాహితీమంజీర

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Question paper model for all semesters

Part A : 6 లఘు ప్రశ్నలకు 4 చేయాలి. = 4X5 = 20

Part B : 7, 8, 9, 10 వ్యాసరూపప్రశ్నలు Internal Choice 4 x 15 = 60

Exam 80+

Internal Assessment 20 = 100 Marks

HEAD
Dept. of Telugu 19.07.2019
Osmania University
Hyderabad-07, Telangana.

Chairman
Board of Studies In Telugu
Osmania University Hyderabad

B.A., B.SC., B.COM & B.B.A (C.B.C.S) IST SEMESTER

TELUGU (IInd LANGUAGE)

SCHEME OF THE QUESTIONPAPER

TIME :3 HRS MARKS :80

అ భాగం (సంగ్రహసమాధానాలు)

ఏవేని **నాలుగు** ప్రశ్నలకు క్లుప్తంగా సమాధానాలు రాయండి. **4x5=20**

1. ప్రాచీనపద్యభాగంనుండి ఒకసందర్భం
2. ఆధునికపద్యభాగంనుండి ఒకసందర్భం
3. . కవిపరిచయం (ప్రాచీన. ఆధునికపద్యభాగంనుండి)
4. నానార్థాలు (5) రాయాలి. (చాయస్ లేదు)
5. పర్యాయపదాలు (5) రాయాలి. (చాయస్ లేదు)
6. నవలనుండి చిన్నప్రశ్న ఒకటి రాయాలి .

ఆ భాగం (వ్యాసరూపసమాధానాలు)

అన్ని ప్రశ్నలకు వివరంగా సమాధానాలు రాయండి. **15x4=60**

7. ప్రాచీన పద్యభాగం నుండి రెండు పద్యాలు ఉంటాయి (ఒకదానికి సందర్భం. కవిపరిచయం. ప్రతిపదార్థతాత్పర్యాలు. వ్యాకరణాంశాలు వివరించాలి)

8. ప్రాచీన/ ఆధునిక పద్యభాగం నుండి రెండుప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి.)

9. నవల నుండి రెండుప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి.)

10. తెలుగు వాక్యనిర్మాణరీతులను సోదాహరణంగా తెల్పండి. **లేదా**

మూడుసంధులను / మూడు సమాసాలను లక్ష్యలక్షణ సమన్వితంగా వివరించాలి

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HEAD
Dept. of Telugu
Osmania University
Hyderabad-07, Telangana.
07.2019

Prof. V. Nithyanandam 19/7

Chairman
Board of Studies In Telugu
Osmania University Hyderabad

C.B.C.S PATTERN SYLLABUS FROM 2019 ON WARDS.

B.A., B.SC., B.COM & B.B.A 2nd SEMESTER TELUGU (11nd LANGUAGE)

Unit.No.1 ప్రాచీన కవిత్వం

1. గజేంద్ర మోక్షం- పోతన
2. హనుమత్ సందేశం- మొల్ల
3. సుభాషితాలు-ఏనుగులక్ష్మణకవి

Unit.No.11 ఆధునిక కవిత్వం

1. స్నేహలతలేఖ-రాయప్రోలు సుబ్బారావు
2. అంతర్నాదం-దాశరథి
3. ప్రపంచపదులు-సి. నారాయణరెడ్డి
4. అల్లిదా-కౌముది

Unit.No.111 వచన విభాగం

1. యుగాంతం-నెల్లూరి కేశవస్వామి
2. ఎంకన్న-పి.యశోదారెడ్డి
3. మామిడిపండు-సురవరంప్రతాపరెడ్డి
4. మా ఊరుపోయింది.-కృష్ణశాస్త్రి

Unit.No.1V ఛందస్సు

(ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, ఆటవెలది, తేటగీతి, ద్విపద, సీసం, కందం, ఉత్సాహం, తరళం, స్రగ్ధర, మహాస్రగ్ధర, ముత్యాలసరం)

పాఠ్యగ్రంథం: తెలుగు అకాడమీ వారి సాహితీమంజీర

★★★★★

HEAD
Dept. of Telugu
Osmania University
Hyderabad-07, Telangana.
7.2019

Chairman
Board of Studies in Telugu
Osmania University Hyderabad

B.A., B.SC., B.COM & B.B.A (C.B.C.S) 2 nd SEMESTER

TELUGU (11nd LANGUAGE)

SCHEME OF THE QUESTIONPAPER

TIME :3 HRS MARKS :80

అ భాగం(సంగ్రహసమాధానాలు)

ఏవేని **నాలుగు** ప్రశ్నలకు క్లుప్తంగా సమాధానాలు రాయండి. **4x5=20**

1. ప్రాచీనపద్యభాగంనుండి ఒకసందర్భం
2. ఆధునికపద్యభాగంనుండి ఒకసందర్భం
3. పాఠ్యభాగంలోని కవి/రచయిత పరిచయం
4. ఆధునిక కవితాఖండిక –విశ్లేషణ
5. వచనవిభాగానికి సంబంధించి ఒక ప్రశ్న
6. పద్యపాదాన్ని ఇచ్చి గణవిభజన చేసి యతిస్థానాన్ని ఛందస్సును గుర్తించుట

ఆ భాగం(వ్యాసరూపసమాధానాలు)

అన్ని ప్రశ్నలకు **విపరంగా సమాధానాలు రాయండి.** **15x4=60**

7. ప్రాచీన పద్యభాగం నుండి రెండు పద్యాలు ఉంటాయి (ఒకదానికి సందర్భం, కవిపరిచయం, ప్రతిపదార్థతాత్పర్యాలు. వ్యాకరణాంశాలు విపరించాలి)

8. ప్రాచీన/ ఆధునిక పద్యభాగాల నుండి రెండు ప్రశ్నలుంటాయి. (ఒకదానికి సమాధానం రాయాలి.)
9. వచనవిభాగం నుండి రెండుప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి.)
10. మూడు ఛందస్సులను లక్ష్యలక్షణ సమన్వితంగా విపరించాలి **లేదా**

    మూడు పద్యపాదాలను ఇచ్చి గణవిభజన చేసి యతిస్థానాన్ని ఛందస్సును గుర్తించమని అడగాలి.

.....***.....

HEAD 19.07.2019
Dept. of Telugu
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Hyderabad-07, Telangana.

19/7
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Osmania University Hyderabad

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B.A., B.Sc., B.Com., & B.B.A., (CBCS)

Syllabus - 2020

Telugu (Second Language)

3rd Semester

Unit - I. ప్రాచీన పద్యభాగం

1. ధర్మజుని వాక్చాతుర్యం ... తిక్కన
2. విభీషణ శరణాగతి ... గోన బుద్దారెడ్డి
3. గుణనిధి కథ ... శ్రీనాథుడు

Unit - II. ఆధునిక పద్యభాగం

1. రైతు ప్రశస్తి ... వానమామలై జగన్నాధాచార్యులు
2. గురుదక్షిణ ... అంబటి లక్ష్మీనరసింహరాజు
3. గుడిసెలు కాలిపోతున్నై ... డా॥ బోయి భీమన్న

Unit - III. అలంకారాలు

శబ్దాలంకారాలు : వృత్త్యనుప్రాస, ఛేకానుప్రాస, లాటానుప్రాస, అంత్యానుప్రాస, యమకం, ముక్తపదగ్రస్తాలంకారాలు.

అర్థాలంకారాలు : ఉపమ, ఉత్ప్రేక్ష, రూపక, స్వభావోక్తి, ఉల్లేఖ, అర్థాంతరన్యాస, శ్లేష, దృష్టాంతాలంకారాలు.

పాఠ్య గ్రంథం : తెలుగు అకాడమీ వారి 'సాహితీ కిన్నెర' తెలుగు వాచకం

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B.A., B.Sc., B.Com., & B.B.A., (CBCS)

Telugu (Second Language) - 2020

3rd Semester - Scheme of Question Paper

Time : 3 Hrs. **Marks : 80**

ఆ - భాగం (సంగ్రహ సమాధానాలు)

ఏవేని నాలుగు ప్రశ్నలకు సమాధానాలు రాయండి. **4×5 = 20**

1,2. ప్రాచీన పద్యభాగం నుండి ఒక సందర్భం

3,4. ఆధునిక పద్యభాగం నుండి ఒక సందర్భం

5. ప్రాచీన పాఠ్యాంశాల నుండి వస్తు విశ్లేషణ / కవి పరిచయం

6. ఆధునిక పాఠ్యాంశాల నుండి కవుల / రచయితల పరిచయం

ఆ - భాగం (వ్యాసరూప సమాధానాలు)

అన్ని ప్రశ్నలకు సమాధానాలు రాయండి. **15×4 = 60**

7. ప్రాచీన పద్యభాగం నుండి రెండు పద్యాలు ఉంటాయి. (ఒకదానికి సందర్భం, కవి పరిచయం, ప్రతిపదార్థ తాత్పర్యాలు, వ్యాకరణాంశాలు వివరించాలి)

8. ప్రాచీన పద్యభాగం నుండి వస్తు విశ్లేషణ సంబంధించిన రెండు ప్రశ్నలిస్తారు. (ఒకదానికి సమాధానం రాయాలి)

9. ఆధునిక పద్యభాగం నుండి రెండు ప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి)

10. మొత్తం ఆరు శబ్దార్థాలంకారాలు (3 పేర్లు + 3 ఉదాహరణలు) ఇచ్చి మూడింటికి లక్ష్యలక్షణ సమన్వితంగా వివరించమని అడగాలి.

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Syllabus - 2020

Telugu (Second Language)

4th Semester

Unit - I. ప్రాచీన పద్యభాగం

1. నారద గానమాత్సర్యం ... పింగళి సూరన
2. వాగ్దాన భంగం ... ఆసూరి మరింగంటి వేంకట నరసింహాచార్యులు
3. నారసింహ శతకం ... ధర్మపురి శేషప్ప

Unit - II. ఆధునిక పద్యభాగం

1. నరుడ నేను, నరుడ నేను ... కాళోజీ
2. ఆర్తగీతం ... దేవరకొండ బాలగంగాధర తిలక్
3. దేవరకొండ దుర్గం ... డా॥ ముకురాల రామారెడ్డి

Unit - III. వచన విభాగం

1. అర్ధరాత్రి అరుణోదయం ... దాశరథి రంగాచార్య
2. సి.పి.బ్రౌన్ సాహిత్య సేవ ... జానమద్ది హనుమచ్ఛాస్త్రి
3. మన గ్రామ నామాలు ... డా॥ కపిలవాయి లింగమూర్తి
4. నివురు తొలగిన నిప్పు ... పోల్కంపల్లి శాంతాదేవి
5. కొండమల్లెలు ... ఇల్లిందల సరస్వతీదేవి

పాఠ్య గ్రంథం : తెలుగు అకాడమీ వారి 'సాహితీ కిన్నెర' తెలుగు వాచకం

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Telugu (Second Language) - 2020

4th Semester - Scheme of Question Paper

Time : 3 Hrs. **Marks : 80**

అ - భాగం (సంగ్రహ సమాధానాలు)

ఏవేని నాలుగు ప్రశ్నలకు సమాధానాలు రాయండి. 4×5 = 20

1. ప్రాచీన పద్యభాగం నుండి ఒక సందర్భం
2. ఆధునిక పద్యభాగం నుండి ఒక సందర్భం
3. ప్రాచీన, ఆధునిక పాఠ్యాంశాల నుండి వస్తు విశ్లేషణ
4. ఆధునిక పాఠ్యాంశాల నుండి కవుల / రచయితల పరిచయం
5. వచన విభాగం నుండి ప్రశ్న
6. వచన విభాగం నుండి ప్రశ్న

ఆ - భాగం (వ్యాసరూప సమాధానాలు)

అన్ని ప్రశ్నలకు సమాధానాలు రాయండి. 15×4 = 60

7. ప్రాచీన పద్యభాగం నుండి రెండు పద్యాలు ఉంటాయి. (ఒకదానికి సందర్భం, కవి పరిచయం, ప్రతిపదార్థ తాత్పర్యాలు, వ్యాకరణాంశాలు వివరించాలి)
8. ప్రాచీన పద్యభాగం నుండి రెండు ప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి)
9. ఆధునిక పద్యభాగం నుండి రెండు ప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి)
10. వచన విభాగం నుండి రెండు ప్రశ్నలు ఉంటాయి. (ఒకదానికి సమాధానం రాయాలి)

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MAHATMA GANDHI UNIVERSITY, NALGONGA
B.A., B.Sc., B.Com & B.B.A (CBSC)
Syllabus – 2021 - 2022

(Second Language)
V Semester

Unit –I కవితా ప్రక్రియలు

1) పద్యం
2) పాట
3) వచన కవిత
4) మిని కవితా రూపాలు,
   హైకూ, నానీలు, మినీకవితలు
5) రుబాయీలు, గజల్

Unit - II తెలుగు వ్యాసం

6) వ్యాసం నిర్వచనం, లక్షణాలు
7) తెలుగువ్యాస పరిణామక్రమం
8) వ్యాస రచన పద్ధతులు
9) వ్యాస రచన భాషా ప్రయోగం
10) వ్యాసం – వస్తు వైవిధ్యం

Unit – III వచన సాహిత్యం

11. అధ్యయన – సంస్కృతి
12. సాహిత్య అధ్యయనం ప్రయోజనాలు
13. ముందుమాట
14. పుస్తక సమీక్ష
15. జానపద సాహిత్య పరిచయం

MAHATMA GANDHI UNIVERSITY, NALGONGA
B.A., B.Sc., B.Com & B.B.A (CBSC)
Syllabus – 2021 -2022

Telugu (Second language)

VI Semester

Unit –I సాహిత్య ప్రక్రియల పరిచయం

1) నాటకం
2) నవల
3) కథానిక
4) జీవితచరిత్ర
5) ఉపన్యాస కళ

Unit - II **జర్నలిజంలో మౌళికాంశాలు**

6) వార్త – నిర్వచనం, లక్షణాలు
7) లీడ్ - ఎడిటింగ్
8) వార్తా కథనాలు
9) అనువాదం
10) ఇంటర్వ్యూలు

Unit – III ప్రాజెక్టు పరిచయం

11) ప్రాజెక్టు
12) అధ్యయనం
13) పరికల్పన

14) నివేదిక

Department of Hindi,
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Dated: 14-06-2019

A meeting of **U.G. Syllabus Review Committee**, Hindi Department, was held today i.e. on **14-06-2019 at 10:30. A.M**. and the following decisions were taken :-

1. As per the instructions of the Council of Higher Education, Telangana State, it has been resolved to extend the Second Language Hindi to U.G. Third Year also i.e. 5th and 6th Semester also. The syllabus, particularly that of the Third year would be a job oriented one.

2. The total Syllabus of U.G. Second Language Hindi would be of 20 Credits. Viz., 1st Year : 08 Credits (1st Semester : 04, 2nd Semester : 04), 2nd Year : 06 Credits (3rd Semester: 03, 4th Semester: 03) and 3rd Year : 06 Credits (5th Semester: 03, 6th Semester: 03)

3. Likewise the Syllabus for 1st Year (1st and 2nd Semester) and 2nd Year (3rd & 4th Semester) was restructured as per the Credits allotted by deleting certain lessons/topics.

4. The Third Year (5th & 6th) Semester Syllabus would be employment oriented one as per the latest market trends. The same would be prepared in the due course of time.

The Second Semester will consist of **04 Credits**. It was resolved unanimously by the Committee Members, to have the following Lessons of the Prose Book **'Gadya Darpan'**, for the B.A., B.Com., B.Sc., II Semester.

The details of the Lessons marked from the said book for B.A., B.Com., and B.Sc. II Semester (Second Language) are as follows.

(A) GADYA DARPAN (for II Semester B.A., B.Com, B.Sc.)

6. Dharti Ka Swarg	Vishnu Prabhakar
7. Taayee	Vishwambharnath Sharma 'Kaushik'
8. Rajneeti Kaa Bantwaaraa	Harishnakar Parsaai
9. Swami Vivekaanand	Vamshidhar Vidyaalankar
10. Paryaavaran Aur Hum	Rajeev Garg

The following stories have been recommended for the **II Semester from Non Detail 'Kathaa Sindhu'** are as follows.

(B) KATHAA SINDHU (for II Semester B.A., B.Com, B.Sc.)

6. Gadal	Raangeya Raaghav
7. Hansoo Yaa Roun	Vinayak Rao Vidyaalankar
8. Waapasi	Usha Priyamwadaa
9. Sevaa	Mamataa Kaaliyaa
10. Siliyaa	Susheelaa Takbhore

With regard to Grammar the following topics/Subjects were unanimously accepted and recommended for the II Semester by the members.

(C) GRAMMAR RECOMMENDED (forII Semester B.A., B.Com, B.Sc.)

V. Sandhi Vichched
VI. Antonyms (Vilom Shabd)
VII. Letter Writing: Personal Letters, Official Letters. Letter of Complaints, Application for Appointment.

REFERENCE BOOKS RECOMMENDED BY THE COMMITTEE.

1. Saral Hindi Vyaakaran : Dakshin Bharat Hindi Prachaar Sabhaa.
2. Hindi Vyaakaran : Shyam Chandra Kapoor
3. Prathamik Vyaakaran Evam Rachanaa : Harish Chandra.

The Third Semester will consist of **03 Credits**. After discussing in detail the committee members decided that the Title of the Poetry Book will be **'Kavya Nidhi'**, which will consist of **12 Poets** altogether.

It ws resolved to continue Hindi Sahitya Ka Itihas in the Syllabus without any change. Hindi Sahitya Ka Itihas consists of four periods Viz., Aadi Kaal, Bhakti Kaal, Shringaar Kaal and Adhunik Kaal. It was resolved to have Aadi Kaal and Bhakti Kaal in the III Semester and Shringaar Kaal and Adhunik Kaal will be taught in the IV Semester.

The details of the Poets and Poems chosen for B.A., B.Com. and B.Sc. III Semester (Second Language Hindi) are as follows.

I – Kavya Nidhi (For III Semester B.A.,B.Com.,B.Sc.)

1. Kabeer Das	Kabeer Ke Dohe
2. Tulasi Das	Tulasi Das Ke Dohe
3. Maithilisharan Gupt	Navyuvakon Se
4. Ayodhya Singh Upadhyay 'Harioudh'	Phool Aur Kaanta
5. Jai Shankar Prasad	Bharat
6. Subhadra Kumari Chauhan	Mera Nayaa Bachpan

II – Hindi Sahitya Ka Itihas : Main Tendencies of the Following ages.

1. Aadi Kaal : Naamkaran, Paristhitiyaan, Pravrittiyaan
2. Bhakti Kaal : Naamkaran, Paristhitiyaan, Pravrittiyan
3. Brief study of the following Authors and Poets.
   - Chand Bardaai
   - Soor das
   - Tulasi das
   - Sumitranandan Pant
   - Bharatendu Harishchandra
   - Maithilisharan Gupt
   - Ramdhari Singh 'Dinkar'

III – General Essay :

Sahitya Aur Samaaj
Vidyaarthi Aur Rajneeti
Vigyaan : Vardaan Yaa Abhishaap
Adhunik Shikshaa Aur Naari
Shikshaa Par Bhoomandalikaran Kaa Prabhaav
Jeewan Mein Swachchataa Kaa Mahatva

IV – Translation from English or Telugu to Hindi.

The Fourth Semester will be of **3 Credits.**

I – Kavya Nidhi (For IV Semester B.A.,B.Com.,B.Sc.)

7. Raheem	Raheem Ke Dohe
8. Bihaari	Bihari Ke Dohe
9. Sooryakant Tripathi 'Nirala'	Bhagwan Buddh Ke Prati
10. Mahadevi Varma	Ve Muskaate Phool Nahin
11. Ramdhari Singh 'Dinkar'	Kalam Aur Talwaar
12. Harivansh Rai Bachchan	Tu Kyon Baith Gayaa Hai Path Par

II – Hindi Sahitya Ka Itihas : Main Tendencies of the following ages

3. Shringaar Kaal : Naamkaran, Paristhitiyaan, Pravrittiyan
4. Aadhunik Kaal :
   (a) Bhartendu Yug, Dwivedi Yug, Chchyaawaad, Pragatiwaad, Prayogwaad.
   (b) Hindi Gadya Kaa Vikaas, Hindi Kahaani, Upanyaas Aur Naatak
5. Brief Study of the Following Authors and Poets :
   Meera Bai
   Bihaari
   Mahaveer Prasad Dwivedi
   Premchand
   Nirala
   Mahadevi Varma
   Agyeya

III – Essays on General Topics :
Vidyaarthi Aur Anushaasan
Aaj Ki Shiksha Neeti
Bharat Mein Berozgaari Ki Samasyaa
Paryaavaran Aur Pradooshan
Bharat Mein Badhati Huyi Jan Sankhyaa
Bharatiya Sanskriti

IV – Comprehension

Reference Books :-

1. Hindi Sahitya Kaa Itihas – Prof.T.Mohan Singh
2. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Vidyasagar Dayal
3. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Tej Narayan Jaiswal
4. Hindi Sahitya Kaa Subodh Itihas – Gulab Rai

Note:- Unit Wise division of the syllabus for the Four Semesters is as the following:-

SYLLABUS FOR
B.A., B.COM., B.Sc. FIRST SEMESTER HINDI, (04 CREDITS)
SECOND LANGUAGE
OSMANIA UNIVERSITY, W.E.F. 2019-2020

FIRST UNIT – GADAYA DARPAN

1. Charitra Sangathan	Babu Gulaab Raai
2. Baazaar Darshan	Jainendra Kumar

SECOND UNIT – GADYA DARPAN

1. Bhaabhi	Mahadevi Varma
2. Bharat Mein Sanskriti Sangam	Ramdhari Singh 'Dinkar'
3. Raashtra Kaa Swaroop	Vasudev Sharan Agrawal

THIRD UNIT – KATHA SINDHU

1. Sadgati	Premchand
2. Chhotaa Jaadoogar	Jaya Shankar Prasad
3. Sach Kaa Sauda	Sudarshan
4. Praayashchitt	Bagwati Charan Varma
5. Chief Ki Daawat	Bheeshma Saahani

FOURTH UNIT - GRAMMAR

1. Rewriting of Sentences as directed based on Gender, Number, Tense, Case & Voice.
2. Correction of Sentences.
3. Usages of words into Sentences.
4. Official Hindi, Administrative Terminology (Prashaasanik Shabdaavali)
   Official Designations (Padnaam)
   a) Translation of Hindi words into English.
   b) Translation of English words into Hindi.

REFERENCE BOOKS RECOMMENDED BY THE COMMITTEE

1. Saral Hindi Vyaakaran : Daksin Bharat Hindi Prachaar Sabhaa.
2. Hindi Vyaakaran : Shyam Chandra Kapoor.
3. Prathmik Vyakaran Evam Rachana : Harish Chandra.

SYLLABUS FOR
B.A., B.COM., B.Sc. SECOND SEMESTER HINDI, (04 CREDITS)
SECOND LANGUAGE
OSMANIA UNIVERSITY, W.E.F. 2019-2020

FIRST UNIT – GADAYA DARPAN

1. Dharti Ka Swarg	Vishnu Prabhakar
2. Taayee	Vishwambharnath Sharma 'Kaushik'

SECOND UNIT – GADYA DARPAN

1. Rajneeti Ka Bantwara	Hari Shankar Parasaai
2. Swami Vivekanand	Vanshidhar Vidyalankar
3. Paryawaran Aur Hum	Rajeev Garg

THIRD UNIT – KATHA SINDHU

1. Gadal	Raangeya Raaghav
2. Hansoo Yaa Roun	Vinayak Rao Vidyaalankar
3. Waapasi	Usha Priyamwadaa
4. Sevaa	Mamataa Kaaliyaa
5. Siliyaa	Susheelaa Takhbore

FOURTH UNIT - GRAMMAR

1. Sandhi Vichched
2. Antonyms (Vilom Shabd)
3. Letter Writing: Personal Letters, Official Letters, Letter of Complaints, Applications for Appointment.

REFERENCE BOOKS RECOMMENDED BY THE COMMITTEE

1. Saral Hindi Vyaakaran : Daksin Bharat Hindi Prachaar Sabhaa.
2. Hindi Vyaakaran : Shyam Chandra Kapoor.
3. Prathmik Vyakaran Evam Rachana : Harish Chandra.

SYLLABUS FOR
B.A., B.COM., B.Sc. THIRD SEMESTER HINDI, (03 CREDITS)
SECOND LANGUAGE
OSMANIA UNIVERSITY, W.E.F. 2020-2021

FIRST UNIT – KAVYA NIDHI

1. Kabeer Ke Dohe	Kabeer Das
2. Tulasi Das Ke Dohe	Tulasi Das
3. Navayuvakon Se	Maithilisharan Gupt
4. Phool Aur Kaanta	Ayodhya Singh Upadhyaya 'Harioudh'
5. Bharat	Jaya Shankar Prasad
6. Mera Nayaa Bachpan	Subhadra Kumari Chauhan

SECOND UNIT – HINDI SAHITYA KA ITIHAS : MAIN TENDENCIES OF THE FOLLOWING AGES:

1. Aadi Kaal : Naamkaran, Paristhitiyaan, Pravrittiyaan
2. Bhakti Kaal : Naamkaran, , Paristhitiyaan, Pravrittiyaan

Hindi Sahitya Ka Itihas : Brief Study of the Following Authors and Poets:-
Chand Bardaai
Soor Das
Tulasi Das
Sumitranandan Pant
Bharatendu Harishchandra
Maithilisharan Gupt
Ramdhari Singh 'Dinkar'

THIRD UNIT–GENERAL ESSAY (ON SOCIO-POLITICAL AND LITERARY SUBJECTS) & TRANSLATION

A) Essay:-
Sahitya Aur Sammaj
Vidyaarthi Aur Rajneeti
Vigyaan : Vardaan Yaa Abhishaap
Adhunik Shikshaa Aur Naari
Shikshaa Par Bhoomandalikaran Kaa Prabhaav
Jeewan Mein Swachchataa Kaa Mahatva.

B) Translation:-

REFERENCE BOOKS:-
1. Hindi Sahitya Kaa Ithihas – Prof.T.Mohan Singh
2. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Vidyasagar Dayal
3. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Tej Narayan Jaiswal
4. Hindi Sahitya Kaa Subodh Ithihas – Gulab Rai

SYLLABUS FOR
B.A., B.COM., B.Sc. FOURTH SEMESTER HINDI, (03 CREDITS)
SECOND LANGUAGE
OSMANIA UNIVERSITY, W.E.F. 2020-2021

FIRST UNIT – KAVYA NIDHI

1. Raheem Ke Dohe.	Raheem
2. Bihari Ke Dohe	Bihari
3. Bhagwan Buddh Ke Prati	Soorya Kant Tripathi 'Nirala'
4. Ve Muskaate Phool Nahin	Mahadevi Varma
5. Kalam Aur Talwaar	Ramdhari Singh 'Dinkar'
6. Tu Kyon Baith Gayaa Hai Path Par	Harivansh Rai Bachchan

SECOND UNIT – HINDI SAHITYA KA ITIHAS : MAIN TENDENCIES OF THE FOLLOWING AGES:

3. Reethi Kaal : Naamkaran, Paristhitiyaan, Pravrittiyaan
4. Aadhunik Kaal :
   a) Bhartendy Yug, Dwivedi Yug, Chchyaawaad, Pragatiwaad, Prayogwaad.
   b) Hindi Gadya Kaa Vikaas : Kahaani, Upanyaas Aur Naatak.

Brief Study of the Following Authors and Poets:-

Meera Bai
Bihari
Mahaveer Prasad Dwivedi
Premchand
Mahadevi Varma
Nirala
Agyeya

THIRD UNIT–GENERAL ESSAY AND COMPREHENSION :

A) Essay :-

Vidyaarthi Aur Anushaasan
Aaj Ki Shiksha Neeti
Bharat Mein Berozgaari Ki Samasyaa
Paryaavaran Aur Pradooshan
Bharat Mein Badhati Huyi Jansankhyaa
Bharatiya Sanskriti

B) Comprehension :-

REFERENCE BOOKS:-

1. Hindi Sahitya Kaa Ithihas – Prof.T.Mohan Singh
2. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Vidyasagar Dayal
3. Hindi Sahitya Kaa Sankshipt Itihas – Dr.Tej Narayan Jaiswal
4. Hindi Sahitya Kaa Subodh Ithihas – Gulab Rai

B.A., B.Com., B.Sc., B.B.A, B.S.W. (C.B.C.S)

1st Semester
Hindi 2nd Language
Scheme of Question Paper

Time : 3 hrs **Max. Marks. 80**

खण्ड– 'क' (लघु प्रश्नोत्तर)

I. किन्हीं चार प्रश्नों के संक्षेप में उत्तर दीजिए 4x5= 20

1) 'गद्य दर्पण' से प्रश्न।
2) 'गद्य दर्पण' से प्रश्न।
3) 'कथा सिन्धु' से प्रश्न।
4) 'कथा सिन्धु' से प्रश्न।
5) व्याकरणांशों से प्रश्न।
6) व्याकरणांशों से प्रश्न।

खण्ड– 'ख' (दीर्घ प्रश्नोत्तर)

II. निम्नलिखित प्रश्नों के उत्तर विस्तार से लिखिए 4x15= 60

7) 'गद्य दर्पण' से दिये गए 4 गद्यांशों में से किन्हीं दो की सन्दर्भ सहित व्याख्या करना है। $2x7\frac{1}{2} = 15$

8) 'गद्य दर्पण' से पूछे गए दो निबन्धात्मक प्रश्नों में से किसी एक का उत्तर लिखना है। 1x15= 15

9) (क) 'कथा सिन्धु' से पूछे गए दो निबन्धात्मक प्रश्नों में से किसी एक का उत्तर लिखना है। 1x10= 10

(ख) 'कथा सिन्धु' से दिये गए तीन पात्रों में से किसी एक का चरित्र–चित्रण करना है। 1x5= 5

10) (क) दिये गए 6 वाक्यों में से किन्हीं 4 वाक्यों को निर्देशानुसार लिखना है। 4x1= 4

(ख) दिये गए 5 अशुद्ध वाक्यों में से किन्हीं 3 के शुद्ध रूप लिखना है। 3x1= 3

(ग) दिये गए 6 शब्दों में से 3 का अपने वाक्यों में प्रयोग करना है। 3x1= 3

(घ) दिये गए 8 (4 अंग्रेज़ी + 4 हिन्दी) प्रशासनिक शब्दों/पदनामों में से किन्हीं 5 का हिंदी/अंग्रेज़ी में अनुवाद करना है। 5x1= 5

B.A., B.Com., B.Sc., B.B.A, B.S.W. (C.B.C.S)

2nd Semester
Hindi 2nd Language
Scheme of Question Paper

Time : 3 hrs **Max. Marks. 80**

खण्ड– 'क' (लघु प्रश्नोत्तर)

I. किन्हीं चार प्रश्नों के संक्षेप में उत्तर दीजिए 4x5= 20

1) 'गद्य दर्पण' से प्रश्न।
2) 'गद्य दर्पण' से प्रश्न।
3) 'कथा सिन्धु' से प्रश्न।
4) 'कथा सिन्धु' से प्रश्न।
5) व्याकरणांशों से प्रश्न।
6) व्याकरणांशों से प्रश्न।

खण्ड– 'ख' (दीर्घ प्रश्नोत्तर)

II. निम्नलिखित प्रश्नों के उत्तर विस्तार से लिखिए 4x15= 60

7) 'गद्य दर्पण' से दिये गए 4 गद्यांशों में से किन्हीं दो की सन्दर्भ सहित व्याख्या करना है। $2x7\frac{1}{2}= 15$

8) 'गद्य दर्पण' से पूछे गए दो निबन्धात्मक प्रश्नों में से किसी एक का उत्तर लिखना है। 1x15= 15

9) (क) 'कथा सिन्धु' से पूछे गए दो निबन्धात्मक प्रश्नों में से किसी एक का उत्तर लिखना है। 1x10= 10

(ख) 'कथा सिन्धु' से दिये गए तीन पात्रों में से किसी एक का चरित्र–चित्रण करना है। 1x5= 5

10) (क) दिये गए 8 शब्दों में से किन्हीं 4 का सन्धि–विच्छेद करना है। 4x1= 4

(ख) दिये गए 8 शब्दों में से किन्हीं 4 के विलोम रूप लिखना है। 4x1= 4

(ग) पूछे गए दो (औपचारिक/अनौपचारिक) पत्रों में से एक को लिखना है। 1x7= 7

B.A., B.Com., B.Sc., B.B.A, B.S.W. (C.B.C.S)

3rd Semester
Hindi 2nd Language
Scheme of Question Paper

Time : 3 hrs **Max. Marks. 80**

खण्ड– 'क'

I. किन्हीं चार प्रश्नों के संक्षेप में उत्तर दीजिए 4x5= 20

1) 'काव्यनिधि' के प्राचीन पद्य भाग से प्रश्न।
2) ''काव्यनिधि' के प्राचीन पद्य भाग से प्रश्न।
3) 'काव्यनिधि' के नवीन पद्य भाग से प्रश्न।
4) 'काव्यनिधि' के नवीन पद्य भाग से प्रश्न।
5) हिन्दी साहित्य के इतिहास (आदिकाल) से प्रश्न
6) हिन्दी साहित्य के इतिहास (भक्तिकाल) से प्रश्न।

खण्ड– 'ख'

II. निम्नलिखित प्रश्नों के उत्तर विस्तार से लिखिए 4x15= 60

7) 'काव्यनिधि' से दिये गए 4 पद्यांशों में से (प्राचीन पद्य भाग से 2 और नवीन पद्य भाग से 2) किन्हीं दो की सन्दर्भ सहित व्याख्या करना है। $2x7\frac{1}{2} = 15$

8) नवीन पद्य भाग की चार कविताओं में से पूछे गए दो निबन्धात्मक प्रश्नों में से एक का उत्तर लिखना है। 1x15= 15

9) (क) 'हिन्दी साहित्य के इतिहास से पूछे गए दो निबंधात्मक प्रश्नों (आदिकाल से एक और भक्तिकाल से एक) में से किसी एक का उत्तर लिखना है। 1x10= 10

(ख) निर्धारित सात साहित्यकारों में से– दिये गए तीन साहित्यकारों में से किसी एक का संक्षिप्त परिचय लिखना है। 1x5= 5

10) (क) निर्धारित 6 विषयों (शीर्षकों) में से– दिये गए 3 निबंधों में से एक लिखना है। 1x10= 10

(ख) दिये गए 8 अंग्रेज़ी वाक्यों में से किन्हीं पाँच का हिंदी में अनुवाद करना है। 5x1= 5

B.A., B.Com., B.Sc., B.B.A, B.S.W. (C.B.C.S)

4th Semester

Hindi 2nd Language

Scheme of Question Paper

Time : 3 hrs **Max. Marks. 80**

खण्ड– 'क'

I. किन्हीं चार प्रश्नों के संक्षेप में उत्तर दीजिए 4x5= 20

1) 'काव्यनिधि' के प्राचीन पद्य भाग से प्रश्न।

2) ''काव्यनिधि' के प्राचीन पद्य भाग से प्रश्न।

3) 'काव्यनिधि' के नवीन पद्य भाग से प्रश्न।

4) 'काव्यनिधि' के नवीन पद्य भाग से प्रश्न।

5) हिन्दी साहित्य के इतिहास (रीतिकाल) से प्रश्न

6) हिन्दी साहित्य के इतिहास (आधुनिक काल) से प्रश्न।

खण्ड– 'ख'

II. निम्नलिखित प्रश्नों के उत्तर विस्तार से लिखिए 4x15= 60

7) 'काव्यनिधि' से दिये गए 4 पद्यांशों में से (प्राचीन पद्य भाग से 2 और नवीन पद्य भाग से 2) किन्हीं दो की सन्दर्भ सहित व्याख्या करना है। $2x7\frac{1}{2} = 15$

8) नवीन पद्य भाग की चार कविताओं में से पूछे गए दो निबन्धात्मक प्रश्नों में से एक का उत्तर लिखना है। 1x15= 15

9) (क) 'हिन्दी साहित्य के इतिहास से पूछे गए दो निबंधात्मक प्रश्नों (रीतिकाल से एक और आधुनिक काल से एक) में से किसी एक का उत्तर लिखना है। x10= 10

(ख) निर्धारित सात साहित्यकारों में से– दिये गए तीन साहित्यकारों में से किसी एक का संक्षिप्त परिचय लिखना है। 1x5= 5

10) (क) निर्धारित 6 विषयों (शीर्षकों) में से– दिये गए 3 निबंधों में से एक लिखना है। 1x10= 10

(ख) बोधगम्य गद्यांश– दिये गए गद्यांश से संबंधित 5 प्रश्नों का उत्तर लिखना है। 5x1= 5

OU-UG- S/L Hindi

From : 2019-20

Question Paper Model for all semesters

part A : 6 लघु प्रश्नों में से 4 के उत्तर लिखने होंगे। 4 x 5 = 20

Part B : 7,8,9, 10 दीर्घ प्रश्न (Internal Choice) 4 x 15 = 60

Exam	: 80
Internal Assessment	: 20
	100

Second Language Hindi U.G. V th & VI th Sem Syllabus

V Th Sem

Unit 1, हिन्दी भाषा के विविध रूप

2. प्रयोजन मूलक हिन्दी
3. राष्ट्र भाषा
4. राज भाषा
5 संपर्क भाषा

Unit 2- 1, अनुवाद

2, अनुवाद शब्द की उत्पत्ति, अर्थ, परिभाषा, एवं स्वरूप

3, अनुवाद का महत्व

4, अनुवाद के प्रकार

5, अनुवादक के गुण

6. अनुवाद का अभ्यास

Unit 3. 1, साहित्य की विविध विधाओं का परिचय
2 कविता
3, ~~अभ्यास~~ कहानी
4, उपन्यास
5, नाटक
6 एकांकी
7 निबन्ध
8 आत्मकथा

9. संस्मरण
10. देखा चित्र

VI Th Sem -

Unit - 1 जनसंचार के माध्यम

2. जनसंचार का अर्थ, परिभाषा एवं स्वरूप

3 जनसंचार का महत्व

4. जनसंचार के प्रकार

5. श्रव्य, दृश्य, मुद्रण

6. जनसंचार का दायित्व

7. इलेक्ट्रानिक एवं अन्य आधुनिक माध्यम

Unit 2. 1. पत्रकारिता

1. पत्रकारिता का अर्थ, परिभाषा एवं स्वरूप

2. पत्रकारिता का इतिहास

3. पत्रकारिता का महत्व

4. पत्रकारिता के प्रकार

5. पत्रकार के गुण

6. हिन्दी के प्रमुख समाचार पत्र

Unit 3. 1. हिन्दी साहित्य में विविध विमर्श

2. स्त्री विमर्श

3. दलित विमर्श

4. अल्पसंख्यक विमर्श

5. आदिवासी विमर्श

DEPARTMENT OF URDU
UNIVERSITY COLLEGE OF ARTS & SOCIAL SCIENCES
MAHATMA GANDHI UNIVERSITY

B.A., B. Sc & B.Com FIRST YEAR -2016-2017
URDU SECOND LANGUAGE
"MUTALA – E – ADAB" (PART – I)

SEMESTER : I

PAPER – I

URDU PROSE & POETRY

UNIT: I

GHAZALS: Selected two Ghazals of every poet like Quli Qutub Shah – Wali Deccani – Siraj Aurangabadi – Meer Taqi Meer.

1.	QULI QUTUB SHAH	1.	Suno Aaqilan Sab Ke Dunai Hai Fani.
		2.	Meri Sanwli manki piyari dise.
2.	WALI DECCANI	1.	Pi ke hote Na Kar Too Mah Ki Sana.
		2.	Sajan ke bad Aalam mein Dagar nain.
3.	SIRAJ AURANGABADI	1.	Mujhku Ek dam kharar Nain Hargis.
		2.	Jo Tere gham ki Tamanna Na Kiya.
4.	MEER TAQI MEER	1.	Koei Nahin Jahan Mein Jo Andhogeen nahin.
		2.	Hum se tuk Aage Zaman-e-mein Huwa Kya Kya Kuch.

UNIT: II

POETRY:

1.	TAWHEED	By	Nazeer Akbarabadi.
2.	MUSTAQBIL	By	Akber Allahabadi.
3.	FUNOON – E – LATIFA	By	Allama Iqbal.
4.	BAARISH	By	Zafar Ali khan.

UNIT: III

HIKAYAAT : By Mazhar Ali Vila – Chand Muntaqab Hikayat.

UNIT: IV

DRAMA: By Imtiaz Ali Taaj & Begum Qudsia Zaida– Talash.

UNIT: V

SAFARNAMA: By Saleha Abed Hussain – Hindustan Jannat Nishan.

Reference Book: Compiled by Urdu Department, Osmania University. Hyd. (Published in August 2008 by Urdu Academy – Hyderabad).

DEPARTMENT OF URDU
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MAHATMA GANDHI UNIVERSITY

B.A., B. Sc & B.Com FIRST YEAR - 2016-2017
URDU SECOND LANGUAGE
"MUTALA – E – ADAB" (PART – I)

SEMESTER : II
PAPER – II

URDU PROSE & POETRY

UNIT : I

GHAZALS: Selected two Ghazals of every poet Hyder Ali Aatish – Mirza Ghalib – Khaja Altaf Hussain Hali – Maqboom Mohiuddin.

1.	HYDER ALI AATISH	1. Soon To Sahi Jahan Mein Hai Tera Fasana Kya. 2. Khusha wa dil ke ho jis dil mein Aarzoo Teri.
2.	MIRZA GHALIB	1. Koyi Din Gar Zindagani Aur hai. 2. Koi ko deke dil koi Nawasaje Fughan Kyun Ho.
3.	KHAJA ALTAF HUSSAIN HALI	1. Mujhe-wo Taab-e Zabt-e-shikayat kahan Hai. 2. Dekhna Her Tarafna Majlis main.
4.	MAQDOOM MOHIUDDIN	1. Aap ki Yaad Aati Rahi Raat bhar 2. Zindagi Moutiyoun ki Dhalakti ladi.

UNIT : II

POETRY:

1.	PREET KA GEET	By Hafeez Jalandhari
2.	AAY SHAREEF INSAANAU	By Sahir Ludhyanavi
3.	AB KE BARAS	By Shaaz Tamkanat

UNIT : III

SWANEH : By Khaja Altaf Hussain Hali– Mirza Ghalib ke Aqlaq – o – Adab.

UNIT : IV

INSHAIYA : By Mushtaq Ahmed Yousufi – Padhye Gar Beemar.

UNIT : V

AFSANA: By Qurratul ain Hyder – Yeh Ghazi Yeh Tere Purasrar Bande.
KHAKA : By Mujtaba Hussain – Sulaiman Areeb.

Reference Book: Compiled by Urdu Department, Osmania University. Hyd. (Published in August 2008 by Urdu Academy – Hyderabad).

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B.A., B. Sc & B.Com SECOND YEAR – 2016-2017
URDU SECOND LANGUAGE

"MUTALA – E – ADAB" (PART – II)

SEMESTER : III

PAPER – III

URDU POETRY & PROSE

UNIT :I

MASNAVI : - Amn Nama by Jaan Nisar Akhtar.

UNIT :II

QASIDA : - Dar Shaan – e – Hameedud Dawla by Zauq Dehelvi .

UNIT :III

DAASTAN : - Intequab – e – Sabras by Mulla Wajhi (Selected from "Sabras").

UNIT :IV

NOVEL : - Nasooh ki Saleem Se Guftagoo by Deputy Nazeer Ahmed (Selected from "Taubatun Nasooh").

UNIT :V

INSHAIYA : - Zauqu – e – chai Noshi – By Maulana Azad (Selected form "Ghubar – e – Khatir").

Reference Book: Compiled by Urdu Department, Osmania University. Hyd. (Published in 2009 by Urdu Academy – Hyderabad).

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B.A., B. Sc & B.Com SECOND YEAR – 2016-2017
URDU SECOND LANGUAGE
"MUTALA – E – ADAB" (PART – II)

SEMESTER : IV

PAPER – IV

URDU POETRY & PROSE

UNIT : I

MARISA - Garmi Ka Saman by Meer Anees.

UNIT : II

1. RUBAIYAT -
   1. Anees – Pursan Kue Kab Jawhar – e – Zati Ka hai.
      Anees – Duniya bhi Ajab Saray – e – Fani Dekhi.
   2. Hali – Duniya – e – Duniyako Naqshe Fani Samjho.
      Hali – Yaro Nahin Waqt Aaram ka Yeh.
   3. Rawaan – Iflas accha Na Fikr – e – Daulat acchi.
      Rawan – Aazad Zameer Huwa Fakhiri Yeh Hai.
   4. Amjad – Koshish hai apni Tamam Sataesh ke liye.
      Amjad – Kam Zarf Agar daulat – o – Zar Pata hai.
2. QATAAT -
   1. Akbar Allahabadi – Chod literature ko apni history ko bhool Ja.
   2. Allama Iqbal - Andaz – e – Bayan Gar che bahot shookh Nahin hai.

UNIT : III

1. KHUTOOT - Two Letters by Safia Akhtar (Selected from "Zere – Lab").
2. MAZMOON - Qadeem Urdu Mein Natural Shaeri – By Naseeruddin Hashmi. (Selected from "Qadeem Deccani ke Chand Tah queeqi mazameen").

UNIT : IV

SATIRE - Murda Badast Zinda – By Mirza Farhatulla Baig (Selected from Mazameen –e – Farath part II).

UNIT : V

REPORTAZ - Kulhind Conference By Izhar Asar.

Reference Book: Compiled by Urdu Department, Osmania University. Hyd. (Published in 2009 by Urdu Academy – Hyderabad).

Annexure – I (Credits)
Proposed CBCS Scheme for B.Sc.
w.e.f 2019-20

Courses		Papers	Total Credits	Credits for each paper / Semester B.Sc.					
				I	II	III	IV	V	VI
Core Courses DSC	Optional-1	4	20	5	5	5	5	-	-
	Optional-2	4	20	5	5	5	5	-	-
	Optional-3	4	20	5	5	5	5	-	-
Elective Courses DSE	Optional-1	2	10	-	-	-	-	5	5
	Optional-2	2	10	-	-	-	-	5	5
	Optional-3	2	10	-	-	-	-	5	5
Language	English(First Language)	5	20	4	4	3	3	3	3
	Second Language	5	20	4	4	3	3	3	3
Ability Enhancement Compulsory Course AECC	Environmental Science / Basic Computer Skills	1	2	2	-	-	-	-	-
	Basic Computer Skills / Environmental Science	1	2	-	2	-	-	-	-
Skill Enhancement Course SEC	SEC1	1	2	-	-	2	-	-	-
	SEC2	1	2	-	-	2	-	-	-
	SEC3	1	2	-	-	-	2	-	-
	SEC4	1	2	-	-	-	2	-	-
Generic Elective GE	Open Stream	1	4	-	-	-	-	4	-
Project Work/Optionals		1	4	-	-	-	-	-	4
Total Credits in each semester				25	25	25	25	25	25
Total Credits in UG				150					
Credits under Non-CGPA		NSS /NCC /sports / Extra curricular	6	Upto 6 (2 in each year)					
		Summer Internship	4	Upto 4 (2 in each, after I & II years)					

Annexure II

Proposed New Grading System

SGPA (SEMESTER GRADE POINT AVERAGE)			
S. No.	Grade Point	Range of marks	Grade Letter
1	10	Equal to and above 90 Marks	A+
2	9	More than or equal to 80 and less than 90 Marks	A
3	8	More than or equal to 70 and less than 80 Marks	B+
4	7	More than or equal to 60 and less than 70 Marks	B
5	6	More than or equal to 55 and less than 60 Marks	C+
6	5	More than or equal to 50 and less than 55 Marks	C
7	4	More than or equal to 40 and less than 50 Marks	D
8	0	Below 40 Marks	F

TELANGANA STATE COUNCIL OF HIGHER EDUCATION
PROPOSED CBCS COMMON CORE SCHEME FOR B.SC. COURSE
OPTIONAL -1: BOTANY

CODE	PAPER TITTLE	Course Type	HPW	Credits
	FIRST YEAR SEMSTER - I			
BS 104	PAPER-I : Microbial Diversity and Lower Plants	DSC-1A	4T+2P=6	4+1=5
	FIRST YEAR SEMSTER - II			
BS 204	PAPER-II: Gymnosperms, Taxonomy of Angiosperms and Ecology	DSC-1B	4T+2P=6	4+1=5
	SECOND YEAR SEMSTER - III			
BS 301	SEC-1: Nursery and Gardening	SEC-1	2	2
BS 302	SEC-2: Biofertilizers and Organic Farming	SEC-2	2	2
BS 304	PAPER-III: Plant Anatomy and Embryology	DSC-1C	4T+2P=6	4+1=5
	SECOND YEAR SEMSTER - IV			
BS 401	SEC-3: Greenhouse Technology	SEC-3	2	2
BS 402	SEC-4: Mushroom Culture Technology	SEC-4	2	2
BS 404	PAPER-IV : Cell Biology, Genetics & Plant Physiology	DSC-1D	4T+2P=6	4+1=5
	THIRD YEAR SEMESTER - V			
BS 501	GE-1: Industrial Microbiology	GE-1	4T	4
BS 502	DSE -1A: Biodiversity & Conservation DSE -1B: Economic Botany DSE -1C: Seed Technology	DSE-1A / DSE-1B / DSE-1C	4+2	4+1
	THIRD YEAR SEMESTER – VI			
BS 601	DSE-3: Project	PROJECT	4	4
BS 602	DSE -2A: Plant Molecular Biology DSE -2B: Tissue Culture and Biotechnology DSE -2C: Analytical Techniques in Plant Sciences	DSE-2A / DSE-2B / DSE-5E	4T+2P=6	4+1=5

AECC: Ability Enhancement Compulsory Course, **SEC**: Skill Enhancement Course, **GE**: Generic Elective, **DSC**: Discipline Specific Core, **DSE**: Discipline Specific Elective.

Minutes of the meeting of Board of Studies in Botany for Under Graduate courses, held in the Department of Botany, University college of Science, Osmania University.

The Board of studies meeting for Under Graduate course has been held on 12.03.2020 in the Department of Botany, University college of Science, Osmania University.

The following members have attended the meeting:

1. Prof. P. Kamalakar
   Chairman, Board of Studies in Botany,
   Osmania University, Hyderabad.

CHAIRMAN
B.O.S. IN BOTANY
O. U. HYD.

2. Prof. S. K. Mahmood
   Head, Department of Botany,
   Osmania University, Hyderabad.

3. Dr. Rama Devi
   Dept. of Botany, University College of Science,
   Osmania University, Hyderabad.

4. Dr. B. Rajani
   Dept. of Botany, University College of Science,
   Osmania University, Hyderabad.

5. Dr. Ameena
   Department of Botany,
   University College for Women,
   Koti, Hyderabad.

6. Dr. K. Shailaja
   Dept. of Botany, University College of Science,
   Osmania University, Hyderabad.

7. Dr. Sushma
   Department of Botany,
   University College for Women,
   Koti, Hyderabad.

8. Dr. A. Vijaya Bhaskar Reddy
   Dept. of Botany, Nizam College,
   Basheerbagh, Hyderabad.

9. Dr. B. Kiran kumar
   Dept. of Botany, University College of Science,
   Osmania University, Hyderabad.

10. Dr. K. Varaprasad
Dept of Botany, Government City College, Hyderabad.

11. Dr. M. Aruna
Dept. of Botany, Telangana University,
Nizambad.

12. Dr. M. Vanaja
Scientist, Central Research Institute for Dryland Agriculture,
Santoshnagar, Hyderabad.

Minutes of the Meeting:

1. The meeting was conducted to discuss and revise the syllabus of B.Sc. CBCS II and III Year, including four semesters.

2. Optional subject, Botany - Syllabus has been revised following TSCHE Proposed CBCS Scheme and UGC Guidelines, for Under Graduate Courses, to be implemented from the Academic year, 2019-20.

3. II and II Year semester wise course under Choice Based Credit System (CBCS) has been designed with four Discipline specific Core (DSC) Papers, four Skill Enhancement Course (SCE) Papers, Six Discipline Specific Electives (DSE) (out of six, two Papers have to be selected), One Generic Elective (GE) and One Project/Dissertation.

4. Two more DSC papers, one per Semester, from III - Semester to IV – Semester Plant Anatomy and Embryology (DSC-1C: Semester-III) and Cell Biology, Genetics and Plant Physiology (DSC-1D: Semester-IV) were prepared. Each core will carry 5 Credits, theory (4 credits) and practicals (1 credit). The Syllabus for each paper is added with a list of suggested books to refer followed by theory and practical Model question papers. Teaching hours per will be 60 Hours (60 Lectures) for theory and 30 Hours (2 hours per class) for practical classes.

5. Syllabus for Six DSE papers Ecology and Biodiversity (DSE -1A),: Economic Botany (DSE -1B) DSE -1C: Seed Technology (DSE -1C) in Semester –V and Genetics and Molecular Biology (DSE-2A), Tissue Culture and Biotechnology (DSE -2B) Analytical Techniques in Plant Sciences (DSE-2C) in Semester -VI are placed in Third year, three in each semester, V & VI. Out of three electives only one has to be chosen per semester. The Discipline specific elective papers carry 5 credits, theory (4 credits) and practicals (1 credit) like the core papers.

6. Practical syllabi were also revised to be in association with theory. Each Practical paper, 2 hours per week pertained to 1 credit.

7. Syllabus for four papers of skill enhancement course (SEC), designed. Two SECs in III - Semester, another two in IV-Semesters will carry 2 credits per paper. Revised SECs, Nursery and Gardening (SEC-1) and Biofertilizers and Organic Farming (SEC-2) are placed in III-Semester, followed by Greenhouse Technology (SEC-3) and Mushroom Culture Technology (SEC-IV) in IV-Semester.

8. Syllabus for Generic elective, Industrial Microbiology (GE-1) has been designed for V-Semester. One GE paper carries 4 credits (Theory only).
9. PROJECT WORK: Introducing Research Component in Under-Graduate Courses Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. Project / Dissertation work should be given in view of local application subject knowledge. The Project / Dissertation work would be of 4 credits.

10. Choice based selection of project and group wise allotment of students to teaching faculty is indispensable.

11. Offered project work may vary from college to college depending upon the infrastructural facilities and may differ yearly. Project will involve experimental / field work and the student will have to do this in the time after their regular theory and practical classes.

12. The final evaluation of the project work will be through a committee involving internal and external examiners.

13. The members discussed thoroughly and prepared the syllabus for B.Sc. Botany - II & III Year, compatible to the revised Core and Elective paper titles with respect to TSCHE Scheme.

14. The changes suggested by the members of BOS committee, senior faculty and Subject experts were incorporated in the syllabus, following UGC Guidelines.

15. It is resolved to approve the revised syllabi of all the papers of 2nd and 3rd year, (Semester-III, IV, V and VI) Botany (Optional-1) to be implemented for the B.Sc. Batch 2019-22.

B.Sc. BOTANY
II Year: Semester-III
Paper – III: Plant Anatomy and Embryology

DSC - 1C **Credits- 4**

Theory Syllabus **(60 hours)**

UNIT – I **(18h)**

1. Meristems: Types, histological organization of shoot and root apices and theories.
2. Tissues and Tissue Systems: Simple, complex and special tissues.
3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal outgrowths.
4. General account of adaptations in xerophytes and hydrophytes.

UNIT - II **(16h)**

5. Stem and root anatomy: Vascular cambium - Formation and function.
6. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Bignonia*, *Dracaena*; Root– *Beta vulgaris*
7. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*), Rosewood (*Dalbergia latifolia*), Red sanders (*Pterocarpus santalinus*), Nallamaddi (*Terminalia tomentosa*) and Neem (*Azadirachta indica*).

UNIT – III **(10h)**

8. History and importance of Embryology.
9. Anther structure, Microsporogenesis and development of male gametophyte.
10. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.

UNIT-IV **(16h)**

11. Pollen morphology, pollination and fertilization, Pollination Types, Pollen – pistil interaction, Double fertilization.
12. Seed – structure appendages and dispersal mechanisms
13. Endosperm – Development and types. Embryo development and types; Polyembryony and Apomixis - an outline.

***

References:

1. Bhattacharya et. al. 2007. A textbook of Palynology, Central, New Delhi.
2. Bhojwani, S. S. and S. P. Bhatnagar. 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House, Delhi.
3. M.R.Saxena- A textbook of Palynology.
4. Vashista- A textbook of Anatomy.
5. P.K.K.Nair- A textbook of Palynology.
6. Esau, K. 1971. Anatomy of Seed Plants. John Wiley and Son, USA.
7. Johri, B. M. 1984. Embryology of Angiosperms. Springer-Verleg, Berlin.
8. Kapil, R. P. 1986. Pollination Biology. Inter India Publishers, New Delhi.
9. Maheswari, P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
10. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

B.Sc. BOTANY

II Year: Semester-III

Paper – III: Plant Anatomy and Embryology

DSC - 1C | Credits- 1

Practical syllabus (45 hours)

1. Demonstration of double staining technique.
2. Tissue organization in root and shoot apices using permanent slides
3. Preparation of double stained Permanent slides

   Primary structure: Root - *Cicer, Canna; Stem – Tridax, Sorghum*

   Secondary structure: Root – *Tridax* sp.; Stem –*Pongamia*

   Anomalous secondary structure: Examples as given in theory syllabus.
4. Anatomy of Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
5. Stomatal types using epidermal peels.
6. Structure of anther and microsporogenesis using permanent slides.
7. Structure of pollen grains using whole mounts - *Hibiscus, Acacia* and Grass).
8. Pollen viability test using Evans Blue – *Hibiscus*
9. Study of ovule types and developmental stages of embryo sac.
10. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocot embryos using permanent slides.

Practical Model Paper

Time: 3 hrs | **Max. marks: 50**

1. Identify the given material "**A**", Prepare a double stained permanent mount of transverse section of given the given material. 15M
2. Prepare a temporary mount of epidermal peel of the given leaf material " **B** " and identify the stomatal type . 7M
3. Conduct the pollen viability test "**C**" (OR) Isolate the embryo from the given material . 6M
4. Identify and describe the specimens / slides with well labeled diagrams

   (a) Embryology – **D** (b) Palynology – **E** (c) Anatomy – **F** 3 X 4 = 12M
5. Record 5M
6. Viva 5M

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B.Sc. Botany

II Year: Semester-III

Skill Enhancement Course

SEC-1 **(Credits - 2)**

Nursery and Gardening

Lectures: 30

Unit-I **(15h)**

1. Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.
2. Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology - seed testing and certification.
3. Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glass house.

Unit-II **(15h)**

4. Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping - Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.
5. Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.
6. Features of a garden: Garden wall, Fencing, biofencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India. Cultivation of Important cut flowers: Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids.

* Field trip is essential.

Suggested Readings

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

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B.Sc. Botany
II Year: Semester-III
Skill Enhancement Course

SEC-2 **(Credits - 2)**

Biofertilizers and Organic Farming (30h)

UNIT - I: **(15h)**

1. Manures and Biofertilizers: Types of fertilizers, manures. Manure composition. Manures for crop productivity.
2. Differences between fertilizers and biofertilizers: pH changes and water contamination.
3. Bacterial Biofertilizers: General account on the microbes used as biofertilizer.
4. Algal Biofertilizers: Associative effect of different microorganisms. *Azolla* and *Anabaena-azollae* association, nitrogen fixation, factors affecting growth, *Azolla* in rice cultivation.

UNIT - II: **(15h)**

5. Fungal Biofertilizers: Mycorrhizal association, types of mycorrhizal association, occurrence and distribution, phosphorus nutrition, growth and yield, colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.
6. Organic Farming: Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and industrial wastes, Biocompost making- types, method of vermicomposting, Panchakavya. Biological pest control (neem).

Suggested Readings

1. Dubey R.C. 2005. A Text book of Biotechnology. S.Chand & Co. New Delhi.
2. Kumaresan V. 2005. Biotechnology. Saras Publications. New Delhi.
3. John Jothi Prakash E. 2004. Outlines of Plant Biotechnology. Emkay Publication. New Delhi.
4. Sathe T.V. 2004. Vermiculture and Organic Farming. Daya Publishers. New Delhi.
5. Subha Rao N.S. 2000. Soil Microbiology, Oxford & IBH Publishers. New Delhi.
6. Vayas S.C, Vayas S. and Modi H.A. 1998.Bio-fertilizers and organic Farming Akta Prakashan. Nadiad.

B.Sc. BOTANY
II YEAR: Semester-IV

Paper IV: Cell Biology, Genetics and Plant Physiology

DSC-1D **Credits-4**

Theory Syllabus (60 hours)

UNIT I: (15h)

1. Plant cell envelops: Ultra structure of cell wall, Models of membrane structure, structure and functions of Semi permeable Plasma membrane.
2. Cell Organelles: Structure and semiautonomous nature of Mitochondria and Chloroplast.
3. Nucleus: Ultra structure, types and functions of DNA & RNA. Mitochondrial DNA & Plastid DNA and Plasmids.
4. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. Special types of chromosomes: Lampbrush and Polytene chromosomes.
5. Cell division: Cell and its regulation; mitosis, meiosis and their significance

UNIT – II: (15 hours)

6. Mendelism: History, Principles of inheritance, Chromosome theory of inheritance, Autosomes and sex chromosomes, Incomplete dominance and Co-dominance. Multiple alleles, Lethal alleles, Epistasis, Recessive and Dominant traits, Polygenic inheritance.
7. Linkage and crossing over, Recombination frequency, two factor and three factor crosses; Interference and coincidence. Numericals based on gene mapping; Sex Linkage.
8. Variation in chromosome number and structure: Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy
9. Gene mutations: Types of mutations; Molecular basis of Mutations; Mutagens-physical and chemical (Base analogs, deaminating, alkylating and intercalating agents);

Unit-III (15h)

10. Plant -water Relations: Water potential, osmosis, osmotic and pressure potential, absorption and transport of water.
11. Mineral Nutrition: Essential micro & macro nutrients and symptoms of mineral deficiency.
12. Transpiration: Stomatal structure and movement.
13. Mechanism of phloem transport.
14. Enzymes: Nomenclature, properties, Classification and factors regulating enzyme activity.

UNIT- IV (15h)

15. Photosynthesis: Photosynthetic pigments, Cyclic and Non-cyclic Photophosphorylation. Carbon assimilation pathways: C3, C4 and CAM.
16. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle and oxidative phosphorylation.
17. Nitrogen Metabolism: Biological nitrogen fixation.
18. Physiological role of Phytohormones: Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids

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Reference:

1. Sharma, A. K. and A. Sharma. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
2. Shukla, R. S. and P. S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
3. Verma, P. S. and V. K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi. 1. Hopkins, W. G. 1995.
4. Introduction to Plant Physiology. John Wiley & Sons Inc., New York, USA
5. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & sons, India. 8th edition.
6. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
7. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. Benjamin Cummings, U.S.A. 10th edition.
8. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
9. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
10. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition.
11. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition.
12. Russell, P. J. (2010). iGenetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3rd edition.
13. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
14. Jain, J.L., S. Jain and Nitin Jain. 2008. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
15. Pandey, B. P. 2007. Botany for Degree Students: Plant Physiology, Biochemistry, Biotechnology, Ecology and Utilization of Plants. S. Chand & Company Ltd., New Delhi.
16. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc.,USA.
17. Taiz, L. and E. Zeiger. 1998. Plant Physiology (2nd Ed.). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
18. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

B.Sc. BOTANY
II YEAR: Semester-IV

Paper IV: Cell Biology, Genetics and Plant Physiology

DSC-1D **Credits-1**

Practical Syllabus (60 hours)

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.
2. Study of various stages of mitosis using cytological preparation of Onion root tips.
3. Study of ultra structure of cell organelles using photographs. Chloroplast, Mitochondria, Nucleus,
4. Study of Special types of Chromosomes (Polytene chromosome and Lampbrush chromosomes- Permanent slide)
5. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square analysis.
6. Chromosome mapping using test cross data.
7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4)
8. Determination of osmotic potential of vascular sap by Plasmolytic method using leaves of *Rheodiscolor / Tradescantia.*
9. Determination of rate of transpiration using Cobalt chloride method
10. Determination of stomatal frequency using leaf epidermal peelings / impressions
11. Determination of amylase activity using potato tubers by titration method
12. Separation of chloroplast pigments using paper chromatography technique
13. Estimation of protein by Biurette method
14. Mineral deficiency symptoms of Micro and Macro nutrients

Practical Model Question Paper

Time: 3 hrs **Max. marks: 50**

1. Prepare a cytological slide of given material "A" and identify & describe any two stages with well labeled diagrams. (12M)
2. Genetics problem (10M)
3. Physiology Experiment (12M)
4. Identify and Comment on A & B (2x3 =6M)
   A. Micronutrient / Macronutrients Deficiency symptoms
   B. Cell organelles / Special type of Chromosomes
5. Record (5M)
6. Viva (5M)

B.Sc. BOTANY

II Year: Semester-IV

Skill Enhancement Course

SEC-3 **Credits-2**

Greenhouse Technology (30h)

UNIT – I

(15h)

1. Introduction; scope – classification of greenhouses – construction of greenhouse- heating unit – cooling unit – environmental control (light and temperature).
2. Net- poly houses- low cost green houses. Root media for greenhouses
3. Fertilizers: Organic and inorganic, liquid fertilizers, application of fertilizers.
4. Water in the Greenhouses: Irrigation system in green houses – misting, Drip irrigation- micro irrigation, water quality, water sanitation.

UNIT – II

(15h)

5. Plant Protection in Greenhouses: Diseases of greenhouse plants (bacterial, fungal, nematodes and viral diseases)
6. Management of pest and diseases – integrated pest management.
7. Applications of Greenhouse Technology: Importance of greenhouse technology. Micropropagation and greenhouse planting of tissue culture transplants
8. Advantages and disadvantages of greenhouse technology. Seed production, cut flower gardening.

Suggested Readings

1.Dubey R.C. 2006. A text book of Biotechnology. S.Chand and Company. New Delhi.

2. Sheela V.L. 2011. Horticulture.MJP Publishers. Chennai,

3. Prasad S., Kumar U. 2012. Green House Management for Horticultural Crops. Agrobios India.

4. Pant V. and Nelson. 1991. Green House Operation and Management. Bali Publication. New Delhi.

5. Introduction to soil science: http://www.agrimoon.com/wpcontent/uploads/Introduction-tosoil-science.pdf

6. Greenhouse applications: http://www.lindegas.com/en/products_and_supply/fumigants/carbon_dioxide_in_agriculture/greenhouse_applications/index.html

7. Role of greenhouse technology in agricultural engineering:

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B.Sc. BOTANY

II Year: Semester-IV

Skill Enhancement Course

SEC-4 (Credits 2)

Mushroom Culture Technology

Lectures: 30

UNIT-I
(15h)

1. Introduction & history. Medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus*.
2. Cultivation Technology: Infrastructure; substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag.
3. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves.
4. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.

UNIT-II
(15h)

5. Storage: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions.
6. Nutritional value of Mushrooms: Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.
7. Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Suggested Readings

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.

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B.Sc. BOTANY

Skill Enhancement Course (SEC)

Time : 2 hrs **Max. Marks: 40**

Theory - Model Question Paper

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 6 X 4 = 24M

1. Unit-I
2. Unit-I
3. Unit-I
4. Unit-II
5. Unit-II
6. Unit-II

II. Essay Questions: 2 X 8 = 16M

7. a. Unit-I

   (OR)

   b. Unit-I
8. a. Unit-II

   (OR)

   b. Unit-II

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*** Internal Exam carries 10 Marks**

B.Sc. BOTANY

Discipline Specific Core (DSC)

Time :3 hrs **Max. Marks: 80**

Theory - Model Question Paper

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 8 X 4 = 32M

1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-III
7. Unit-IV
8. Unit-IV

II. Essay Questions: 4X 12 = 48M

9. a. Unit-I

   (OR)

   b. Unit-I
10. a. Unit-II

    (OR)

    b. Unit-II
11. a. Unit-III

    (OR)

    b. Unit-III
12. a. Unit-IV

    (OR)

    b. Unit-IV

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*** Internal Exam carries 20 Marks**

B.Sc. BOTANY

III Year: Semester-V

Paper-1A: Biodiversity & Conservation

DSE-1A **Credits-4**

Theory Syllabus (60 hours)

Unit - I: (15h)

1. Plant diversity and its scope: Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodiversity and cultivated plant taxa, wild taxa.
2. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.

Unit-II: (15h)

3. Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss.
4. Management of Plant Biodiversity: Organizations associated with biodiversity, management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR.
5. Biodiversity legislation and conservation, Biodiversity information management and communication.

Unit-III: (15h)

6. Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem Diversity
7. Principles of conservation - *Insitu* and *Exsitu* conservation. Sacred groove, Botanical garden, Biosphere reserves, Sanctuaries, National parks (*Insitu*) and Tissue culture, Gene / seed / pollen banks and Cryopreservation (*Exsitu*).

Unit-IV: (15h)

8. Role of plants in relation to Human Welfare; Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India.
9. Alcoholic beverages through ages. Fruits and nuts, Important fruit crops and their commercial importance. Wood and its uses.

References:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
2. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.
3. Odum, E. P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.
4. Sharma, P. D. 1989. Elements of Ecology. Rastogi Publications, Meerut.

B.Sc. BOTANY

III Year: Semester-V

Paper-1A: Biodiversity & Conservation

DSE-1A **Credits-1**

Practical Syllabus (30 hours)

1. Study on local biodiversity: Herbs, shrubs and trees; Seasonal, Annual, biennial and perennial plants.
2. Study of morphological characteristics of plant communities: Hydrophytes (*Eichhornia, Hydrilla, Pistia, Nymphaea, Vallisneria*), Xerophytes: (*Asparagus, Opuntia, Euphorbia milii, Casuarina, Calotropis*).
3. Assessment of biodiversity
   - i) Avenue trees: *Pongamia pinnata*, *Butea monosperma, Spathodea* sp., *Delonix regia*, *Jacaranda mimosifolia*, *Cassia fistula*, *Mimusops elengi*, *Acacia leucophloea*, and *Albizia lebbeck.*
   - ii) Ornamental Plants: Any five locally available ornamental plants.
   - iii) Timber Value: *Acacia nilotica*, *Tectona grandis* and *Azardirachta indica*
   - iv) Fruits: *Mangifera indica* (Mango), *Ziziphus mauritiana*, *Psidium guajava* (Guava), *Annona squamosa*
   - v) Nuts: *Anacardium occidentale* (Cashew), *Terminalia catappa* (Badam)
   - vi) Beverages: *Madhuca indica*, *Camellia sinensis* (Tea),*Coffea arabica* (Coffee), *Borassus flabellifer* (Toddy palm) and *Caryota urens*
   - vii) Medicinal value: *Catharanthus roseus*, *Tinospora cordifolia* and *Phyllanthus emblica*, *Ocimum sp.*, and *Azardirachta indica*
4. Field trip: Collection of plants from the field, identification and preparation of Herbarium.

Practical Model Question Paper — 3 Hours

50 Marks

1. Identify and describe Biodiversity value of a) Medicinal b) Timber c) Fruit.	3x4=12M
2. Any two available ornamental plants and their uses.	2x3=06M
3. Comment on the specimens A, B & C	3x3=09M
4. Identify and describe Biodiversity value of the given slides D & E (Hydrophytes & Xerophytes)	2x4=08M
5. Field trip Herbarium.	05M
6. Record	05M
7. Viva	05M

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B.Sc. BOTANY

III Year: Semester-V

Paper-1B: Tissue Culture and Biotechnology

DSE-1B **Credits-4**

Theory Syllabus (60 hours)

UNIT – I: (15 hours)

1. Tissue culture: Introduction, sterilization procedures, explants, culture media - composition and preparation; Nutrient and hormone requirements, Micropropagation.
2. Organ culture: Totipotency, Vegetative Organs-Root, Shoot, Leaf culture Reproductive Organs-Anther, Ovule, Embryo culture
3. Callus culture and isolation and fusion of protoplast culture
4. Organogenesis, Embryogenesis (somatic and zygotic).

UNIT- II: (15 hours)

5. Applications of tissue culture: Production of pathogen free plants and stress resistant plants, somaclonal variants and synthetic seeds.
6. Induction of hairy roots and its applications in production of secondary metabolites.
7. Haploidy and triploids, Cryopreservation and Germplasm Conservation.
8. Somatic hybrids and Cybrids.

UNIT- III: (15 hours)

9. Biotechnology: Introduction, history, scope and applications.
10. rDNA technology: Basic aspect of gene cloning, Enzymes used in gene cloning-Restriction enzymes, Ligases, Polymerases.
11. Gene cloning: Recombinant DNA, Bacterial Transformation and selection of recombinant clones, vectors- cloning vehicles (Plasmid, Cosmids, Bacteriophages, & Phasmids; Eukaryotic Vectors (YAC) Gene Construct; Applications of rDNA technology.

UNIT - IV: (15 hours)

12. Gene Libraries: construction of genomic and cDNA libraries, colony hybridization; Probes-oligonucleotide, Polymerase Chain Reaction (PCR) and its applications.
13. Methods of gene transfer- Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics-selectable marker and reporter genes.
14. Application of transgenics in improvement of crop productivity and quality traits. Pest resistant transgenic crops (Bt-cotton & Bt-brinjal); herbicide resistant plants (Roundup Ready soybean); crops with quality traits (Flavr Savr tomato, Golden rice).

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References:

1. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004.
2. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Limited, Hyderabad.
4. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
5. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
6. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977.
7. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press (India). Private Limited, Hyderabad..
8. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
9. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA.
10. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
12. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
13. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
14. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
15. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

B.Sc. BOTANY

III Year: Semester-V

Paper-1B: Tissue Culture and Biotechnology

DSE-1B **Credits-1**

Practical Syllabus

30 Hours

Major Experiments

1. Isolation of plant DNA. (Tomato)
2. Production of synthetic seeds /Encapsulation of embryo
3. Preparation of plant tissue culture medium - MS medium
4. Isolation of protoplasts.

Minor Experiments

1. Callus induction
2. Demonstration of Micropropagation/multiple shoots
3. Anther culture
4. PCR –Demonstration
5. Study of biotechnology products: Samples of antibiotics and vaccines
6. Photographs of Gene transfer methods.
7. Instruments used in Biotechnology lab- Autoclave, Laminar air flow, Hot air oven and Incubator.
8. Demonstration of In-vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.

Spotting

1. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.
2. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment.
4. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.
5. Restriction digestion and gel electrophoresis of plasmid DNA.

Practical Model Question Paper

3 Hours **Max. Marks: 50**

1. Major Experiment	(18 marks)
Isolation of DNA	
(OR)	
Production of synthetic seeds / Encapsulation of embryo	
2. Minor Experiment	(10 marks)
Callus / Micropropagation / Multiple shoots	
3. Spotters	(3x4=12 marks)
A. Vaccines	
B. Antibiotics	
C. Gene transfer methods / instruments	
4. Record	(5 marks)
5. Viva	(5 marks)

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B.Sc. BOTANY

III YEAR: Semester-V

Paper-1C: Seed Technology

DSE – 1C **Credits-4**

Theory Syllabus (60 hours)

UNIT- I (15h)

1. Seed: Structure and types.
2. Seed development in cultivated plants, seed quality concept, importance of genetic purity of seed. Hybrid seed production and Heterocyst.
3. Cross pollination, Emasculation, role of pollinators and their management.
4. Collection and storage of pollen for artificial pollination.

UNIT-II (15h)

5. Seed germination: Internal and external factors affecting germination.
6. Physiological processes during seed germination; seed respiration, breakdown and mobilization of stored seed reserves.
7. Seed dormancy: Types, causes and methods of breaking dormancy. Role of Phytochrome.

UNIT-III (15h)

8. Cultural practices and harvesting of Seed: Isolation, Sowing, Cultural practices, harvesting and threshing of the following crops: a) Rice b) Cotton c) Sunflower
9. Seed treatment to control seed borne disease –General account
10. Seed testing- Procedures of seed testing, seed testing laboratories and importance of seed testing.

UNIT-IV (15h)

11. Seed viability, factors affecting seed viability and genetic erosion.
12. Seed storage: Long term and short term storage. Orthodox and recalcitrant seeds. Packing of seeds – Principles, practices, bagging and labelling.
13. Seed banks- National, International and Millennium seed banks.
14. Seed certification- History, Seed certification agency, Indian millennium, general and specific seed certification standard.

Reference:

1. Agrawal, P. K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation. National Seed Corporation Ltd., New Delhi
2. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Bedell, Y. E. Seed Science and Technology. Indian Forest Species. Allied Publishers Limited, New Delhi.
4. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Limited, Hyderabad.
5. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
6. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
7. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977..
8. Hartman, H. T. and D. E. Kestler. 1976. Plant Propagation: Principles and Practices. Prentice & Hall of India, New Delhi.
9. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press (India) Private Limited, Hyderabad..
10. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
11. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA..
12. Tiwari, G. N. and R. K. Goal. Green House Technology – Fundamentals, Design, Modelling and Application. Narosa Publishing House, New Delhi.
13. Tunwar, N. S. and S. V. Singh. 1988. Indian Minimum Seed Certification Standards. The Central Seed Certification Board, Govt. of India, New Delhi.
14 Agrawal PK & Dadlani M. (Eds.). 1992. Techniques in Seed Science and Technology. South Asian Publ.
15. Baskin CC & Baskin JM. 1998. Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination. Academic Press. Basra AS. 2006. Handbook of Seed Science and Technology. Food Product Press.
16. Bench ALR & Sanchez RA. 2004. Handbook of Seed Physiology. Food Product Press. Bewley JD & Black M. 1982. Physiology and Biochemistry of Seeds in Relation to Germination. Vols. I, II. Springer Verlag.
17. Bewley JD & Black M. 1985. Seed: Physiology of Seed Development and Germination. Plenum Press.
18. Copeland LO & Mc Donald MB. 1995. Principles of Seed Science and Technology. 3rd Ed. Chapman & Hall.
19. Khan AA. 1977. Physiology and Biochemistry of Seed Dormancy and Germination. North Holland Co.
20. Kigel J & Galili G. (Eds.). Seed Development and Germination. Marcel Dekker.
21. Murray DR. 1984. Seed Physiology. Vols. I, II. Academic Press. Sadasivam S & Manickam A. 1996. Biochemical Methods. 2nd Ed. New Age.

B.Sc. BOTANY

III YEAR: Semester-V

Paper-1C: Seed Technology

DSE – 1C **Credits-1**

Practical syllabus (30 hours)

Major Experiment

1. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC).
2. Estimation of amylase activity of germinating seeds (Qualitatively).
3. Demonstration of seed dressing using fungicides to control seed borne diseases.
4. Demonstration of seed dressing using Biofertilizers (BGA) to enrich nutrient supply.

Minor Experiments

5. Emasculation, bagging of flower for hybrid seed production.
6. Dissection of Dicot embryo (bean) and Monocot embryo (maize).
7. Pollen viability test using Evan's blue staining (Hibiscus).
8. Harvesting and Importance of following seeds:
   a) Rice
   b) Maize
   c) Cotton
   d) Groundnut and
   e) Sunflower.
9. Methods to break Seed dormancy
10. Study visits to research institutes, seed tests and certification laboratories and Places, seed banks.

Practical Model Question Paper

3 Hours **Max. marks: 50**

1. Major Experiment. (16 marks)
   a) Estimation of amylase activity in germinating seeds.
   (OR)
   b) Seed viability test by triphenyl tetrazolium chloride (TTC)
2. Minor Experiment. (12 marks)
   a) Dissection of Dicot / Monocot embryo
   (OR)
   b) Methods to break Seed dormancy / Seed dressing.

3. Spotters (3x4=12 marks)
   A. Emasculation / Bagging
   B. Germination of seeds.
   C. Importance of following seeds: rice, cotton and sunflower.
4. Record (5 marks)
5. Viva (5 marks)

B.Sc. BOTANY

III YEAR: Semester-V

Generic Elective (GE)

GE-1 (Credits: 4)

Industrial Microbiology

Lectures: 60

Unit I (15h)

1. Scope of microbes in industry and environment
2. Bioreactors/Fermenters and fermentation processes
3. Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations.
4. Components of a typical bioreactor, Types of bioreactors-laboratory, pilot scale and production fermenters.

Unit II (15h)

5. Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.
6. Microbial production of industrial products: Microorganisms involved, media, fermentation conditions, downstream processing and uses;
7. Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying.
8. Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin).

Unit III (15h)

9. Microbial enzymes of industrial interest and enzyme immobilization
10. Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis.
11. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acetylase).
12. Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.

Unit IV: (15h)

13. Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems.
14. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.
15. Microbes in agriculture and remediation of contaminated soils.
16. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.

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Suggested Readings

1. Pelzar, M.J. Jr., Chen E.C. S., Krieg, N.R. (2010). Microbiology: An application based approach. Tata McGraw Hill Education Pvt. Ltd., Delhi.
2. Tortora, G.J., Funke, B.R., Case. C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition.

B.Sc. Botany
III Year: Semester-VI
Paper-2A: Plant Molecular Biology

DSE-2A **Credits -4**

Theory syllabus

Lectures: 60

Unit-I: (15 hours)

1. Nucleic acids: Carriers of genetic information, types of genetic material, DNA as the carrier of genetic information.
2. Structures of DNA: Salient features and Types of DNA, Organization of DNA in Prokaryotes. Mitochondrial and chloroplast DNA.
3. Structure of RNA: Structure and Types of RNA's (mRNA, rRNA and tRNA).

Unit-II (15 hours)

4. Nucleosome, Chromatin structure - Euchromatin, Heterochromatin; Constitutive and Facultative heterochromatin.
5. Replication of DNA: Chemistry of DNA synthesis, general principles, Semi-conservative replication of DNA, replication of linear ds-DNA, replication of the 5'end of linear chromosome.
6. Central dogma and genetic code: Central Dogma (Adaptor hypothesis and discovery of mRNA template), salient features of Genetic code.

Unit-III: (15 hours)

7. Mechanism of Transcription: Transcription in prokaryotes and eukaryotes; Split genes-concept of introns and exons, removal of introns, eukaryotic mRNA processing (5' cap, 3' polyA tail).
8. RNA editing and mRNA transport.

Unit-IV: (15 hours)

9. Translation in prokaryotes: Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation.
10. Transcriptional regulation in prokaryotes, Regulation of lactose metabolism (Lac operon) and tryptophan (Trp operon) synthesis in E.coli.

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B.Sc. Botany
III Year: Semester-VI
Paper-2A: Plant Molecular Biology

DSE-2A **Credits -1**

Practical Syllabus

1. Isolation of genomic DNA from E.Coli.
2. DNA isolation from cauliflower head / tomato fruit.
3. DNA estimation by diphenylamine reagent/UV Spectrophotometry.
4. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).
5. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.
6. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)
7. Study of the following through photographs: Assembly of Spliceosome machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.
8. Estimation of size of a DNA fragment after electrophoresis using DNA markers (through photographs).

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments

1. Major Experiment 15M
2. Minor Experiment 10M

II. Spotters 4X3=12M

A)
B)
C)
D)

III. Identify and describe the photograph 3M

IV. Viva 5M

V. Record 5M

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B.Sc. Botany
III Year: Semester-VI
Paper-2B: Economic Botany

DSE-2B **Credits-4**

Theory Syllabus 60 hours

UNIT - I

1. Origin of Cultivated Plants: Major plants introduction, Crop domestication and examples of crops / varieties
2. Vegetables: Nutritional and Commercial values of root crops, leafy and fruit vegetables.
3. Millets: Nutrient significance of Sorghum, Finger millet, Pearl millet, Foxtail millet.
4. Cereals: Rice, Wheat and maize - Origin, morphology and uses.

UNIT – II

5. Legumes: General account, importance to man and ecosystem.
6. Fruits and nuts: Commercial and nutritional value of South Indian fruits. Cashew nut, Almond and Walnut.
7. Sugars & Starches: Morphology and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.
8. Spices: Listing of important spices, part used, economic importance with special reference to fennel, saffron, clove and black pepper

UNIT - III

9. Beverages: Tea, Coffee (morphology, processing & uses)
10. Edible oils & Fats: General description, extraction, uses and health implications of groundnut, sunflower, coconut, linseed, and mustard.
11. Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.
12. Natural Rubber: Para-rubber - tapping, processing and uses.

UNIT - IV

13. Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis.
14. Tobacco processing, uses and health hazards
15. Timber plants: General account with special reference to teak and pine
16. Fibres: Classification based on the origin of fibres, extraction methods and uses of Cotton and Jute.

Suggested Readings

1. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
3. Chrispeels, M.J. and Sadava, D.E. (2003). Plants, Genes and Agriculture. Jones & Bartlett Publishers.
4. B.P. Pandey (2007). Economic Botany, S. Chand & Company Ltd. New Delhi. 17/e.

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B.Sc. Botany
III Year: Semester-VI
Paper-2B: Economic Botany

DSE-2B **Credits-1**

Practical Syllabus 30 hours

1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove Tea and Cotton through specimens, sections and microchemical tests.
2. Identification and study on nutrient values of locally available vegetables, millets and cereals.
3. Study on nutrient values and commercial status of Cashew nut, Almond and Walnut.
4. Uses and health implications of groundnut, sunflower, coconut, linseed and Brassica.
5. Identification of starch granules.
6. Quantitative estimation and comparative study of proteins in millets and cereals.
7. Collection of economically important plants / vegetable plants and preparation of Herbarium.

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments	
A) Protein test (Major Experiment)	12M
B) Starch granules (Minor Experiment)	6M
II. Spotters	4X3=12M
C) Leafy / Fruity Vegetables,	
D) Fruits / Spices,	
E) Medicinal Plants / Beverages,	
F) Wood / Timber / Fiber	
III. Herbarium	10M
IV. Viva	5M
V. Record	5M

***

B.Sc. Botany
III Year: Semester-VI

Paper-2C: Analytical Techniques in Plant Sciences

DSE-2C Credits - 4

Theory Syllabus Lectures: 60

Unit I:

1. Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy.
2. Use of fluorochromes: Fluorescence-activated cell sorting (FACS); Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting.
3. Transmission and Scanning electron microscopy - sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit II:

4. Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, $CsCl_2$ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.
5. Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment.
6. Spectrophotometry: Principle and its application in biological research.

Unit III:

7. Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.
8. Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids;
9. Electrophoresis: PAGE, SDS-PAGE

Unit IV:

10. Biostatistics: Statistics, data, population, samples, parameters;
11. Representation of Data: Tabular, Graphical; Measures of central tendency:
12. Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.

Suggested Readings

1. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGrawHill Publishing Co. Ltd. New Delhi. 3rd edition.
2. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A.
3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.
4. Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition.

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B.Sc. Botany
III Year: Semester-VI
Paper-2C: Analytical Techniques in Plant Sciences

DSE-2C **Credits - 1**

Practical Syllabus

Lectures: 30

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separate DNA (marker) using PAGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

Practical Exam - Model Paper

Time: 3 Hours **Max. Marks: 50**

I. Experiments

A. Major Experiment	12M
B. Minor Experiment	8M
II. Permanent slide preparation	8M
III. Spotters	4X3=12M

C)
D)
E)
F)

IV. Viva	5M
V. Record	5M

***

B.Sc. Botany

Theory Model Question Paper

Discipline Specific Elective (DSE)
&
Generic Elective (GE)

Time :3 hrs **Max. Marks: 80**

Draw well-labeled diagrams wherever necessary

I. Write short answer of the following 8 X 4 = 32M

1. Unit-I
2. Unit-I
3. Unit-II
4. Unit-II
5. Unit-III
6. Unit-III
7. Unit-IV
8. Unit-IV

II. Essay Questions: 4X 12 = 48M

9. a. Unit-I

(OR)

b. Unit-I

10. a. Unit-II

(OR)

b. Unit-II

11. a. Unit-III

(OR)

b. Unit-III

12. a. Unit-IV

(OR)

b. Unit-IV

***

*** Internal Exam carries 20 Marks**

B.Sc. Botany

III Year: Semester-VI

Project / Dissertation Work — Credits – 4

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. The Project/Dissertation work will be of 4 credits. Studied subject specific project work can be handled, with a view to develop creative thinking, team spirit and skill. The project work at preliminary level should be assigned to students, in groups.

Project report in the form of dissertation is prepared and submitted by the students. It will be evaluated by the External and Internal Examiners. Head of the Department will chair the evaluation panel and proceedings of viva voce. It carries a maximum of 100 marks.

Project guidelines:

1. Understand the subject broadly.
2. Choose a topic of interest.
3. Refer to the books & interact with subject specific experts.
4. Try to understand the basic principles of Living organisms followed by Plants, with the help of Physics, Chemistry and Statistics.
5. Select the topic applicable locally to know the importance of the subject in daily life. Preferably choose, vegetation around the institution, around home, agricultural crops, vegetable markets and nearby relevant industries.
6. Put together, latest technology and methods, basic knowledge on selected theme, Importance / need, locally applicable.
7. Summarize three years knowledge on the subject, go through Skill enhancement course, correlate to real life and choose the project work.
8. Laboratory facilities, books to refer and faculty with research experience are essential to handle Project.
9. Analyze your Data and Draw a Conclusion
10. Communicate the Results
11. Work division among the group members should be followed
12. Maximum number of students in a group should not exceed 5.

Project Examination — **Max. Marks: 100**

1. Project Report	75 M
3. Seminar Presentation	25 M

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DEPARTMENT OF ZOOLOGY
UNIVERSITY COLLEGE OF SCIENCE
OSMANIA UNIVERSITY

No. 310 /Zool/2020

Date: 22.07.2020

To,
The Dean,
Faculty of Science,
Osmania University.
Hyderabad – 07.

Sub: CBCS UG Course – submission of the approved syllabus of II & III year 2019-20 – Reg.

Ref: Your office Lr. No. 2927/DFSc/OU/2020, dt. 10.02.2020.

Sir,

With reference to above cited, I am herewith submitting the syllabus of II & III year B.Sc. Zoology syllabi of the academic year 2019-20 onwards, under CBCS pattern (both hard and softy copy) for your perusal and necessary action.

Thanking you,

Yours Sincerely,

(PROF. S. JITHENDER KUMAR NAIK)
Chairman, Board of Studies in Zoology
CHAIR MEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

Encl [As above]

CBCS SYLLABUS FOR 2019-2020

UNDER GRADUATE DEGREE COURSE

DEPARTMENT OF ZOOLOGY

UNIVERSITY COLLEGE OF SCIENCE

OSMANIA UNIVERSITY

HYDERABAD

Department of Zoology (46 credits)

Structured syllabus under CBCS for 2019-20 onwards to under graduate course

I. Discipline core course: (5 credits each) (I, II, III, IV Semester)

1. Animal Diversity – Invertebrates
2. Animal Diversity – Vertebrates
3. Animal Physiology and Animal Behaviour
4. Cell Biology, Genetics, and Developmental Biology

II. Discipline specific Elective: (5 credits each – any one paper in V Semester and VI Semester

1. Physiological Chemistry and Endocrinology
2. Immunology and Animal Biotechnology
3. Laboratory Animals Maintenance and Applications
4. Fisheries
5. Limnology
6. Ecology, Zoogeography and Evolution

III. Skill enhancement course: (2 credits) 2 paper in III Semester and 2 papers in IV Semester)

1. Sericulture
2. Apiculture
3. Public health and hygiene
4. Medical diagnostics
5. Poultry and Animal husbandry
6. Vermiculture
7. Vector biology
8. Biomaterial from Animal Source
9. Aquaculture
10. Aquarium Fish Keeping

IV. Generic elective (Open stream) – (4 credit only in V Semester)

1. Preventive Medicine
2. Integrated Pest Management

V. Project/optional paper (4 credit only in VI Semester) In case of not opting project

1. Tools and Techniques in Biology

CHAIRMEN
Board of Studies in Zoology,
Osmania University, Hyd-07.

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

CURRICULUM FOR ZOOLOGY
IN UNDER GRADUATE DEGREE PROGRAMME
CBCS SYLLABUS SCHEDULE 2019-20
Osmania University

Year	Semester	Paper		Title of the Paper	No. of Credits	Exam Hrs.	Max. Marks		
							I.A	End Exam	Total
I	I	Paper - I	Core-I Theory	Animal Diversity- Invertebrates	4	2	20	80	100
			Core-I Practical	Animal Diversity- Invertebrates	1	2	10	40	50
	II	Paper – II	Core-II Theory	Animal Diversity- Vertebrates	4	2	20	80	100
			Core-II Practical	Animal Diversity- Vertebrates	1	2	10	40	50
II	III	Paper – III	Core-III Theory	Animal Physiology and Animal Behaviour	4	2	20	80	100
			Core-III Practical	Animal Physiology and Animal Behaviour	1	2	10	40	50
			SEC-1	Sericulture / Apiculture	2	2	10	40	50
			SEC-2	Public Health and Hygiene/ Medical Diagonistics	2	2	10	40	50
	IV	Paper - IV	Core-IV Theory	Cell Biology, Genetics, and Developmental Biology	4	2	20	80	100
			Core-IV Practical	Cell Biology, Genetics, and Developmental Biology	1	2	10	40	50
			SEC-3	Poultry and Animal Husbandry/ Vermiculture/ Vector Biology	2	2	10	40	50
			SEC-4	Biomaterials from Animals sources / Aquaculture/ Aquarium Fish Keeping	2	2	10	40	50
III	V	Paper - V	DSE-I Theory	Physiological Chemistry and Endocrinology/ Laboratory Animals Maintenance and Applications / Immunology and Animal Biotechnology	4	2	20	80	100
			DSE -I Practical	Physiological Chemistry and Endocrinology/ Laboratory Animals Maintenance and Applications / Immunology and Animal Biotechnology	1	2	10	40	50
			GE – I Theory	Preventive Medicine / Integrated Pest Management	4	2	20	80	100
	VI	Paper - VI	DSE-II Theory	Fisheries / Limnology / Ecology, Zoogeography and Evolution	4	2	20	80	100
			DSE-II Practical	Fisheries / Limnology / Ecology, Zoogeography and Evolution	1	2	10	40	50
				Project / Tools and Techniques in Biology	4	2	20	80	100
					46	**36**	**260**	**1040**	**1300**

DSC – Discipline Specific Core; **DSE –** Discipline Specific Elective; **SEC –** Skill enhancement Course; **GE-** Generic Elective (Open streams)

*Practical one credit equal to 3 hours of instruction

CHAIR MEN
Board of Studies in Zoology
Osmania University

B.Sc. ZOOLOGY I YEAR
SEMESTER-I
CORE PAPER – I
ANIMAL DIVERSITY – INVERTEBRATES

Instructions: 4 hr per week
No. of period: 60
No. of credits: 4

UNIT – I : **(15 Periods)**

1.1 Protozoa.

1.1.1 General characters and classification of Protozoa upto order levels with examples
1.1.2 Type study – *Elphidium*
1.1.3 Locomotion and Reproduction in Protozoa.
1.1.4 Epidemiology of Protozoan diseases - Amoebiasis; Giardiasis; Leishmaniasis and Malaria.

1.2 Porifera

1.2.1. General characters and classification of Porifera upto order levels with examples
1.2.2 Type study – *Sycon*
1.2.3 Canal system in sponges and Spicules.

UNIT – II: **(15 Periods)**

2.1. Cnidaria

2.1.1 General characters and classification of Cnidaria upto order levels with examples
2.1.2 Type study - *Obelia*
2.1.3 Polymorphism in Siphonophora
2.1.4 Corals and coral reef formation

2.2 Platyhelminthes

2.2.1 General characters
2.2.2 Classification of Platyhelminthes up to classes with examples
2.2.3 Type study- *Schistosoma*

2.3 Nemathelminthes

2.3.1 General characters
2.3.2 Classification of Nemathelminthes up to classes with examples
2.3.3 Type study - *Dracunculus*
2.3.4 Parasitic Adaptations in Helminthes

UNIT – III: **(15 Periods)**

3.1 Annelida

3.1.1 General characters
3.1.2 Classification of Annelida up to classes with examples
3.1.3 Type study - *Hirudinaria granulosa.*
3.1.4 Evolutionary significance of Coelome and Coelomoducts and metamerism

3.2 Arthropoda

3.2.1 General characters
3.2.2 Classification of Arthropoda up to classes with examples
3.2.3 Type study - Prawn
3.2.4 Crustacean larvae
3.2.5 Insect metamorphosis
3.2.6 *Peripatus* - Structure and affinities

UNIT – IV: **(15 Periods)**

4.1 Mollusca

4.1.1 General characters
4.1.2 Classification of Mollusca up to classes with examples
4.1.3 Type study - *Pila*
4.1.4 Pearl formation
4.1.5 Torsion and detorsion in gastropods

4.2 Echinodermata

4.2.1 General characters
4.2.2 Classification of Echinodermata up to classes with examples
4.2.3 Water vascular system in star fish
4.2.4 Echinoderm larvae and their significance

Suggested Readings:

1. L.H. Hyman *'The Invertebrates' Vol I, II and V.* – M.C. Graw Hill Company Ltd.
2. Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. E.L. Jordan and P.S. Verma *'Invertebrate Zoology'* S. Chand and Company.
4. R.D. Barnes *'Invertebrate Zoology'* by: W.B. Saunders CO., 1986.
5. Barrington. E.J.W., *'Invertebrate structure and Function'* by ELBS.
6 P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
7. Parker, T.J. and Haswell *'A text book of Zoology'* by, W.A., Mac Millan Co. London.
8. **Barnes, R.D. (1982).** *Invertebrate Zoology*, V Edition"

B.Sc. ZOOLOGY I YEAR
ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER
CORE PAPER – I
ANIMAL DIVERSITY – INVERTEBRATES

Instructions: 3hr per week
No. of credits: 1

1. **Study of museum slides / specimens / models (Classification of animals up to orders)**
   - i. **Protozoa:** Amoeba, *Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax*
   - ii. **Porifera**: *Sycon, Spongilla, Euspongia, Sycon* - T.S & L.S, Spicules, Gemmule
   - iii. **Coelenterata:** *Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula*
   - iv. **Platyhelminthes:** *Planaria, Fasciola hepatica, Fasciola* larval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus, Taenia solium, Schistosoma haematobium*
   - v. **Nemathelminthes:** *Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria*
   - vi. **Annelida:** *Nereis, Aphrodite, Chaetopteurs, Hirudinaria,* Trochophore larva
   - vii. **Arthropoda:** Cancer, Palaemon, Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus,* Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female *Anopheles* and *Culex,* Mouthparts of Housefly and Butterfly.
   - viii. **Mollusca:** *Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
   - ix. **Echinodermata:** *Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon,* Bipinnaria larva

2. **Dissections:**

   Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst
   Insect Mouth Parts

3. **Laboratory Record work shall be submitted at the time of practical examination**

4. An **"Animal album"** containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

5. **Computer aided techniques should be adopted – show virtual dissections**

Suggested manuals:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma
3. Practical Zoology - Invertebrates K.P. Kurl

B.Sc. ZOOLOGY I YEAR
SEMESTER-II
CORE PAPER – II
ANIMAL DIVERSITY- VERTEBRATES

Instructions: 4 hr per week
No. of period: 60
No. of credits: 4

UNIT – I:

1.1 Hemichordata **(15 Periods)**

1.1.1 General characters
1.1.2 Classification of Hemichordata up to classes with examples
1.1.3 *Balanoglossus* - Structure and affinities

1.2. Urochordata, Cephalochordata, Cyclostomata

1.2.1. Salient features of Urochordata
1.2.2. Retrogressive metamorphosis and its significance in Urochordata
1.2.3. Salient features and affinities of Cephalochordata
1.2.4. General characters of Cyclostomata
1.2.5. Comparison of the *Petromyzon* and *Myxine*
1.2.6. General characters and classification of Chordata upto orders with examples.

UNIT – II:

2.1. Pisces **(15 Periods)**

2.1.1. General characters of Fishes
2.1.2. Classification of fishes up to order level with examples
2.1.3. *Scoliodon* – Respiratory, Circulatory and Nervous system.
2.1.4. Types of Scales and types of Fins

2.2. Amphibia

2.2.1. General characters of Amphibians
2.2.2. Classification of Amphibians up to orders with examples.
2.2.3. *Rana tigrina* - Respiratory, Circulatory and Nervous system.
2.2.4. Parental care in amphibian; neoteny and paedogenesis.

UNIT – III :

3.1 Reptilia **(15 Periods)**

3.1.1. General characters of Reptilia
3.1.2. Classification of Reptilia up to orders with examples
3.1.3. *Calotes* – Respiratory system, Circulatory and Nervous system.
3.1.4. Temporal fosse in reptiles and its evolutionary importance
3.1.5. Distinguished characters of Poisonous and Non poisonous snakes.

3.2. Aves

3.1.1. General characters of Aves
3.1.2. Classification of Aves up to orders with examples.
3.1.3. *Columba livia* -, Digestive system, Circulatory systems, Respiratory system and Nervous system.
3.1.4. Migration in Birds
3.1.5. Flight adaptation in Birds

UNIT – IV : **(15 Periods)**

4.1. Mammalia

4.1.1. General characters of Mammalia
4.1.2. Classification of Mammalia up to orders with examples
4.1.3. Rabbit –Digestive, Respiratory, Circulatory and Nervous system.
4.1.4. Dentition in mammals.
4.1.5. Aquatic adaptations in Mammals.

Suggested Readings:

1. **E.L.Jordan and P.S. Verma** *'Chordate Zoology'* -. S. Chand Publications.
2. **Mohan P.Arora**. *'Chordata – I*, Himalaya Publishing House Pvt.Ltd.
3. **Marshal, Parker and Haswell** *'Text book of Vertebrates'*. ELBS and McMillan, England.
4. **Alfred Sherwood Romer**. Thomas S. Pearson *'The Vertebrate Body*, Sixth edition, CBS college Publishing, Saunders College Publishing
5. **George C. Kent, Robert K. Carr**. *Comparative Anatomy of the Vertebrates*, 9th ed. McGraw Hill.
6. **Kenneth Kardong** *Vertebrates: Comparative Anatomy, Function and Evolution*, 4th ed, 'McGraw Hill.
7. **J.W. Young**, *The Life of Vertebrates*, 3rd ed, Oxford University press.
8. **Harvey Pough F, Christine M. Janis, B. Heiser,** *Vertebrate Life,* Pearson, 6th ed, Pearson Education Inc.2002.

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. ZOOLOGY I YEAR
ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER
ZOOLOGY - CORE PAPER - II
ANIMAL DIVERSITY- VERTEBRATES

Instructions: 3hr per week
No. of credits: 1

Study of museum slides / specimens / models (Classification of animals up to orders)

1. **Hemichordata:** *Balanoglossus,* Tornaria larva
2. **Protochordata:** *Amphioxus, Amphioxus* T.S. through pharynx
3. **Cyclostomata:** *Petromyzon, Myxine, Ammocoetus larva*
4. **Pisces:** Sphyrna *Pristis, Torpedo, Channa, Pleuronectes, Hippocampus, Exocoetus, Echieneis, Labeo, Catla, Clarius, Auguilla, Protopterus,* Scales: Placoid, Cycloid, Ctenoid
5. **Amphibia:** *Ichthyophis, Amblystoma, Siren, Hyla, Rachophous,Bufo,Rana,* Axolotal larva
6. **Reptilia :** *Draco, Chemaeleon, Gecko, Uromastix, Vipera russelli, Naja, Bungarus, Enhydrina, Typhlops, Testudo, Trionyx, Crocodilus, Ptyas.*
7. **Aves:** Archaeopteryx, *Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo;* Collection and study of different types of feathers: Quill, Contour, Filoplume, Down
8. **Mammalia:** *Ornithorhynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris,* Hedgehog

Histology: T.S. of Liver, Pancreas, Kidney, Stomach, Intestine, Lungs Artery, Vein, Bone T.S., Spinal cord.

Osteology :

1. Rabbit – Axial skeleton system (bones of Skull and Vertebral Column)
2. Varanus, Pigeon and Rabbit – Appendicular skeleton system (bones of limbs and girdles)

Dissections of *Labeo/Tilapia*:

1. Digestive system.
2. Brain, Weberian ossicles
3. V, VII, IX, X cranial nerves

Laboratory Record work shall be submitted at the time of practical examination
An **"Animal album"** containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Computer aided virtual dissections.

Suggested manuals
1. **S.S.Lal,** Practical Zoology – Vertebrata
2. **P.S.Verma,** A manual of Practical Zoology – Chordata
3. **Freeman & Bracegirdle,** An atlas of embryology

B.Sc. ZOOLOGY II YEAR
SEMESTER-III
CORE PAPER – III: ANIMAL PHYSIOLOGY AND ANIMAL BEHAVIOUR

Instructions: 4 hr per week
No. of period: 60
No. of credits: 4

UNIT – I: **(15 periods)**

1.1 Digestion

- 1.1.1 Enzymes: Definition, classification, inhibition, regulation.
- 1.1.2 Digestion of carbohydrates, proteins, lipids and cellulose
- 1.1.3 Absorption, assimilation of digested food
- 1.1.4 Role of gastrointestinal hormones in digestion

1.2 Excretion

- 1.2.1 Classification of animals on the basis of excretory products:Ammonotelic, Uricotelicand Ureotelic
- 1.2.2 Structure and function of nephron
- 1.2.3 Urine formation counter current mechanism

1.3 Osmoregulation

- 1.3.1 Water and ionic regulation by fresh water
- 1.3.2 Brackish water and marine water animals

UNIT – II: **(15 periods)**

2.1 Homeostasis

- 2.1.1 Concept of homeostasis
- 2.1.2 Mechanism of homeostasis

2.2 Respiration

- 2.2.1 Definition of respiration, respiratory mechanism, external, internal and cellular Respiration
- 2.2.2 Respiratory pigments, transport of oxygen, oxygen dissociation curves, Bohr's effect, transport of carbon dioxide, chloride shift
- 2.2.3 Regulation of respiration: nervous and chemical mechanism

2.3 Circulation

- 2.3.1 Types of circulation: open and closed:Structure of mammalian heart
- 2.3.2 Types of hearts: neurogenic and myogenic
- 2.3.3 Heart functions, conduction and regulation of heartbeat, regulation of heart rate
- 2.3.4 Tachycardia, bradycardia: blood clotting mechanism

UNIT – III: **(15 periods)**

3.1Muscle contraction

- 3.1.1 Types of muscles
- 3.1.2 Ultrastructure of skeletal musclefibre
- 3.1.3 Sliding filament theory of muscle contraction mechanism and energetics
- 3.1.4 Twitch tetanus summation,Treppe fatigue

3.2 Nerves

- 3.2.1 Structure of neuron
- 3.2.2 Resting potential, threshold potential, action potential, conduction of nerve impulse
- 3.2.3 Transmission of nerve impulse
- 3.2.4 Synapse, synaptic transmission neurotransmitters EPSP, IPSP

3.3 Endocrine systems

3.3.1 Endocrine glands- Structure, secretion, function of Pituitary, Thyroid, Parathyroid,Adrenal glands and pancreas

3.3.2 Hormone action and concept of secondary messengers

3.3.3 Male and female hormones, hormonal control of menstrual cycle in human beings

UNIT – IV: **(15 periods)**

4.1 Animal behaviour

4.1.1 Types of behaviour and acquired instinctive behaviour

4.1.2 Behaviourtaxes, reflexes tropisms

4.2 Learning and memory

4.2.1 Types of learning, trial and error learning imprinting, habituation,

4.2.2 **Conditioning:** classical conditioning, instrumental conditioning, examples of conditioning, Pavlov's experiment

4.3Social behaviour and communication:

4.3.1 Colonial existence of bees and termites, pheromones

4.4Biological rhythms

4.4.1 Biological clocks, circadian rhythms, circumlunar rhythms, circannual rhythms

Suggested readings

1. **Gerard J. Tortora and Sandra Reynolds Garbowski** *Principles of Anatomy*
2. *and Physiology*, Tenth Ed., John Wiley & Sons
3. **Arthur C. Guyton MD**, *A Text Book of Medical Physiology,* Eleventh ed., John
4. E. Hall, Harcourt Asia Ltd.
5. **William F. Ganong**, *A Review of Medical Physiology*, 22 ed, McGraw Hill, 2005
6. **Sherwood, Klandrof, Yanc,** *Animal Physiology*, Thompson Brooks/Coole, 2005.
7. **Sherwood, Klandrof, Yanc,** *Human Physiology*, Thompson Brooks/Coole, 2005.
8. **Knut Scmidt-Nielson,** *Animal Physiology*, 5th ed, Cambridge Low Price Edition.
9. **Roger Eckert and Randal,** *Animal Physiology*, 4th ed, Freeman Co, New York.
10. **Singh. H.R,** Text Book of Animal Physiology and Biochemistry
11. **Nagabhushanam** , Comparative Animal Physiology

Veer Bal Rastogi, Text Book of Animal Physiology

B.Sc. ZOOLOGY PRACTICAL SYLLABUS
SEMESTER-III
CORE PAPER – III: ANIMAL PHYSIOLOGY AND ANIMAL BEHAVIOUR

Instructions: 3hr per week
No. of credits: 1

1. Qualitative test of identification of carbohydrates, proteins and lipids.
2. Qualitative test of identification of ammonia, urea, uric acid (nitrogenous excretory products).
3. Zonation of gut in cockroaches.
4. Effect of pH and temperature on salivary amylase activity.
5. Study of permanent histological sections of mammalian endocrine glands: pituitary, thyroid, pancreas, adrenal glands.
6. Estimation of haemoglobin by Sahil's method.
7. Estimation of blood clotting time.
8. Estimation of total protein by Biuret's method.
9. Estimation of unit metabolism of fish.

- Laboratory record work shall be submitted at the time of practical examinations.
- Computer – aided techniques shall be adopted as per UGC guidelines.

B.Sc. ZOOLOGY II Year
SEMESTER- III
PAPER-III (SEC – I): SERICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT- I: **(15 Periods)**

1.1 History and economic importance of sericulture – types of silkworm – Mulberry and non-Mulberry (Tassar, Eri and Muga).
1.2 Systematic position of Bombyx and Life Cycle - Morphology of silk gland.
1.3 Horticulture – mulberry cultivation – Environmental conditions for mulberry cultivation – soil, climatic factors, preparation of land.
1.4 Intercultivation – pruning methods – harvesting
1.5 Diseases and pests of mulberry and control methods.

UNIT- II: **(15 Periods)**

2.1 Silkworm rearing – general principles of silkworm rearing – primary requisite for successful rearing.
2.2 Feeding of silkworm, bed cleaning, sparing, moulting, late age silkworms – Moulting and harvesting economics of silkworm.
2.3 Diseases and pests of silkworm.
2.4 Reeling –reeling appliances and process of reeling cocoons.
2.5 Sericulture as cottage industry.

References:

1. Handbook of sericulture – S.R. Ullal and M. N. Varasimhanna
2. An introduction to sericulture – G. Ganga, J. Sulochana Chetty
3. Manual of Sericulture – FA O Volumes.
4. Handbook of Practical Sericulture : Ullal, S.R. and Narasimhanna, M.N. (1987), Central Silk Board Publication, Bangalore.
5. FAO Manuals on Sericulture : Anonymous (1972), Vol. I-IV
6. Sericulture for Rural Development : Hanumappa (1978), Himalaya Publication,
7. The Silkworm, an Important Laboratory Tool : Tazima, Y. (1978), Kodansha Publications, Tokyo.
8. Control of Silkworm Reproduction, Development and Sex : Strunnikov, V.A. (1983), MIR Publications, Mascow.
9. Ericulture in India Sarkar, D.C. (1988), CSB, Bangalore.
10. Silkworm Rearing : Wupang—Chun and Chen Da-Chung (1988), Pub. By FAO.
11. Handbook of Silkworm Rearing : Anonymous (1972), Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan.
12. Improved Method of Rearing Young age silkworm : Krishnaswamy (1986), CSB Publication, Bangalore.

B.Sc. ZOOLOGY II Year
SEMESTER- III
PAPER-III (SEC – I): SERICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT- I: **(15 Periods)**

1.1 History and economic importance of sericulture – types of silkworm – Mulberry and non-Mulberry (Tassar, Eri and Muga).
1.2 Systematic position of Bombyx and Life Cycle - Morphology of silk gland.
1.3 Horticulture – mulberry cultivation – Environmental conditions for mulberry cultivation – soil, climatic factors, preparation of land.
1.4 Intercultivation – pruning methods – harvesting
1.5 Diseases and pests of mulberry and control methods.

UNIT- II: **(15 Periods)**

2.1 Silkworm rearing – general principles of silkworm rearing – primary requisite for successful rearing.
2.2 Feeding of silkworm, bed cleaning, sparing, moulting, late age silkworms – Moulting and harvesting economics of silkworm.
2.3 Diseases and pests of silkworm.
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References:

1. Handbook of sericulture – S.R. Ullal and M. N. Varasimhanna
2. An introduction to sericulture – G. Ganga, J. Sulochana Chetty
3. Manual of Sericulture – FA O Volumes.
4. Handbook of Practical Sericulture : Ullal, S.R. and Narasimhanna, M.N. (1987), Central Silk Board Publication, Bangalore.
5. FAO Manuals on Sericulture : Anonymous (1972), Vol. I-IV
6. Sericulture for Rural Development : Hanumappa (1978), Himalaya Publication,
7. The Silkworm, an Important Laboratory Tool : Tazima, Y. (1978), Kodansha Publications, Tokyo.
8. Control of Silkworm Reproduction, Development and Sex : Strunnikov, V.A. (1983), MIR Publications, Mascow.
9. Ericulture in India Sarkar, D.C. (1988), CSB, Bangalore.
10. Silkworm Rearing : Wupang—Chun and Chen Da-Chung (1988), Pub. By FAO.
11. Handbook of Silkworm Rearing : Anonymous (1972), Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan.
12. Improved Method of Rearing Young age silkworm : Krishnaswamy (1986), CSB Publication, Bangalore.

B.Sc. ZOOLOGY II YEAR
SEMESTER- III
PAPER-III (SEC – I): APICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: **(15 Periods)**

1.1 History, classification and present status of apiculture industry in India
1.2 Biology of honey bees and bee economy
1.3 Social organization of bee colony
1.4 Selection of bee species for apiculture
1.5 Bee rearing method: artificial Bee rearing (Apiary), Bee hives

UNIT-II: **(15 Periods)**

2.1 Products of apiculture industry and its use – honey; Bees wax; propalic
2.2 Methods of extraction of honey – indigenous and modern
2.3 Bee keeping equipment
2.4 Colony inspection and maintenance of the equipment
2.5 Bee diseases and enemies; control and preventive method

Suggested Reading:

1. Textbook of Applied Zoology, Telugu Academy.
2. Apiculture by Prost P.J. Oxford aro IBH, New Delhi
3. Apiculture by Bisht, ICAR publication

B.Sc. ZOOLOGY II YEAR
SEMESTER - III
PAPER-III (SEC – II): PUBLIC HEALTH AND HYGIENE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT – I: Nutrition, Environment and Health (15 Periods)

1.1 Classification of foods - Carbohydrates, proteins, lipids, vitamins and minerals
1.2 Nutritional deficiencies and disorders- Carbohydrates, proteins, lipids, vitamins and minerals.
1.3 Environment and health Impact assessment: concept, steps and applications.
1.4 Occupational, Industrial, agricultural and urban Health-Exposure at work place, urban areas, health disorders and diseases.
1.5 Environmental pollution and associated Health hazards

UNIT-II: Communicable and Non-Communicable diseases (15 Periods)

2.1 Causes, Symptoms, Diagnosis, Treatment and Prevention of Communicable diseases - Malaria, Filaria, Measles, Polio, Chicken pox, Rabies, Plague, Leprosy, Tuberculosis and AIDS.
2.2 Causes, Symptoms, Diagnosis, Treatment and Prevention of Non-Communicable diseases - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.
2.3 Water borne diseases: Cholera, *E. coli* , Hepatitis and Polio; Air borne diseases: Chickenpox, Influenza, Measles and Tuberculosis
2.4 Health care legislation in India – termination of pregnancy act, Maternity benefit act, Transplantation of human organs act, Child Labour act, Biomedical waste act, ESI act. First Aid and Health awareness, personal health care record maintenance.
2.5 WHO Programmes – Government and Voluntary Organizations and their health services

Suggested Readings:

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur – India.
2. Public Health at the Crossroads Achievements and Prospects. Robert Beaglehole and Ruth
3. Bonita 2nd Edition Cambridge University Press 3. Maxcy Rosenau Last Public Health &
4. Preventive Medicine, Fourteenth Edition Ed RobertWallace, MD, et al. 4.
5. Epidemiology and Management for Health Care: Sathe, P.V. Sathe, A.P., PopularPrakashan,
6. Mumbai, 1991. 5.
7. International Public Health: Diseases, Programs, Systems, and Policies by
8. MichaelMerson, Robert E Black, Anne J Mills Jones and Bartlett Publishers. 6.

B.Sc. ZOOLOGY II YEAR
SEMESTER - III
PAPER-III (SEC – II): MEDICAL DIAGNOSTICS

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: **(15 Periods)**

1.1 Introduction to medical diagnostic and its importance
1.2 Diagnostic methods used for analysis of Blood composition smear preparation. Differential leucocytes count (DLC). Cell counting-RBC, WBC platelet, ESR(Erythrocyte sedimentation Rate), PVC(Packed cell volume) Haemoglobin estimation, Bleeding clotting time. Blood grouping and Rh typing.
1.3 Bone marrow study, Haemopoiesis, Blood coagulation and anticoagulants, Blood banking blood transfusion.
1.4 Clinical biochemistry – blood glucose, serum protein, LFT(Liver Function Test) Lipid profile LDL, VDL, HDL, cholesterol, creatine kinase, LDH, SGPT, SGOT, Anylase, Bile pigments.
1.5 Histopathological techniques, Autopsy and Biopsy, FNAC technique

UNIT-II: **(15 Periods)**

2.1 Urine analysis Physical chemical, microscopic dialysis analysis of body fluids (CSF Synovial fluid, pleural, pericardial, peritomeal Fluids). Sputum and faecal matter for infection.
2.2 Clinical diagnosis of diseases – bacterial (Tuberculosis and Typhoid) antibiotic sensitivity test, viral- hepatitis, AIDS, Polio, Protozoan Malaria, Amoebiasis, Helminthes- Ascaris, Taenia solium,Wucheria
2.3 Clincial diagnosis of non infection diseases – Diabetes, Hypertension, Asthama, Stroke, Arthritis, Heart attack, Cancer –bengin, Malignant metastasis
2.4 Concept of Edema, Hyperaemia, Haemorhage, Hemostais, Thrombosis, Cellular responses – Hyperplasia, Hypertrapy, Metaplasisa, Atropy Necrosis, Apoptosis
2.5 Medical Imaging – X-ray, PET(Positron emission tomography), MRI (Magnetic Resonance Imaging), CT Scan ECG, EEG, Echo tests.

Suggested Readings:

1. Cheesebrough M., A Laboratory Manual for Rural Tropical Hospitals, A basis for training course.
2. Kania Mukherjee, Medical Laboratory Techniques Vol-I, II, III, . Tata MC Graw Hill Publishing company
3. Dr. K. N. Sachdev, Jaypee Brothers, (1988) Clinical Pthology and bacterial and medical publisher.
4. Ramnik Sood, Medcial laboratory Technieques – Jaypee Brothers.
5. Prakash, G. Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
6. Robbins and Cortra, Pathology-I Basis of Disease, VIII Edition, Saunders.
7. Guyton A.C. and Hall J. E textbook of Medical Physiology, saunders.
8. Park, K. Preventive and social medicine, B. B. Publishers.

B.Sc. ZOOLOGY II YEAR
SEMESTER - IV
CORE PAPER – IV:
CELL BIOLOGY, GENETICS & DEVELOPMENTAL BIOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT – I: **(15 Periods)**

1. Cell Biology

1.1. Ultrastructure of animal cell
1.2. Structure and functions of plasma membrane proteins.
1.3. Structure and functions of cell organelles –Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes, Mitochondria and Nucleus
1.4. Chromosomes – Structure, types, giant chromosomes
1.5. Cell Division - Mitosis, Meiosis; Cell cycle and its regulation.

UNIT – II: **(15 Periods)**

2. Molecular Biology

2.1 DNA (Deoxyribo Nucleic Acid) – Structure and RNA (Ribo Nucleic Acid) - Structure, types
2.2 DNA Replication
2.3 Protein Synthesis – Transcription and Translation
2.4 Gene Expression – Genetic Code; operon concept
2.5 Molecular Biology Techniques- Polymerase Chain Reaction, Electrophoresis

UNIT – III: **(15 Periods)**

3. Genetics

3.1 Mendals laws of Inheritance and Non-Medelian Inheritance
3.2 Linkage and Crossing over
3.3 Sex determination and sex-linked inheritance
3.4 Chromosomal Mutations- Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations- Induced versus Spontaneous mutations.
3.5 Inborn errors of metabolism.

UNIT – IV: **(15 Periods)**

4. Developmental Biology and Embryology

4.1 Gametogenesis (Spermatogenesis and Oogenesis) Fertilization; Types of eggs; Types of cleavages
4.2 Development of Frog up to formation of primary germ layers
4.3 Formation of Foetal membrane in chick embryo and their functions
4.4 Types and functions of Placenta in mammals
4.5 Regeneration in Turbellaria and Lizards

Suggested readings:

1. **Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell** *'Molecular Cell Biology'* W.H. Free man and company New York..
2. **Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008).** *Principles of Genetics*. VIII Edition. Wiley India.
3. **Snustad, D.P., Simmons, M.J. (2009).** *Principles of Genetics*. V Edition. John Wiley and Sons Inc.

4. **Klug, W.S., Cummings, M.R., Spencer, C.A. (2012).** *Concepts of Genetics*. X Edition. Benjamin Cummings.
5. **Russell, P. J. (2009).** *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.
6. **Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B.** *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
7. **Gupta P.K.**, 'Genetics'
8. Developmental Biology by **Berryl**
9. Developmental Biology **S. Gilbert**
10. Developmental Biology - patterns, problems and principles by **W. Saunders Jr.**

B.Sc. ZOOLOGY II YEAR PRACTICAL SYLLABUS
SEMESTER - IV
CORE PAPER – IV
CELL BIOLOGY, GENETICS & DEVELOPMENTAL BIOLOGY

Instructions: 3hr per week
No. of credits: 1

I. Cytology

1. Preparation and Identification of slides of Mitotic divisions with onion root tips
2. Preparation and Identification of different stages of Meiosis in Grasshopper Testes
3. Identification and study of the following slides
   i). Different stages of Mitosis and Meiosis
   ii) Lamp brush and Polytene chromosomes

II. Genetics

1. Problems on Genetics - Mendelian inheritance, Linkage and crossing over, Sex linked inheritance

III. Embryology

1. Study of T.S. of Testis and Ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8, 16 cell stages); Morula, Blastula
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

Laboratory Record work shall be submitted at the time of practical examination

An **"Album"** containing photographs, cut outs, with appropriate write-up about Genetics and Evolution.

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

1. Manual of laboratory experiments in cell biology Edward, G.
2. **Freeman & Bracegirdle,** An atlas of embryology

B.Sc. ZOOLOGY II YEAR
SEMESTER- IV
PAPER-IV(SEC-3): POULTRY AND ANIMAL HUSBANDRY

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT -I: Poultry (15 Periods)

1.1 Poultry – present status and future prospects

1.2 Methods of Housing – Housing of chicks in floor and cages, Housing growers in cages and floor, Housing of layers on floor and cages, slatted floor

1.3 Importance of nutrition in poultry production – Classification of food stuffs and their categorization into energy feeds, protein feeds, minerals and vitamins

1.4 Common diseases of poultry and their causative agents, symptoms and treatment
- (i) Viral diseases – Ranikhet disease, Fowl pox, EDS-76 (Egg Drop Syndrome), infection of bursal disease (gumbolo disease)
- (ii) Bacterial diseases – Coli bacillosis, Salmonellosis
- (iii) Fungal diseases – Aspergillosis
- (iv) Parasitic diseases – Tapeworm, Coccidiosis

1.5 Vaccination procedures for broilers, broiler breeders, commercial layers, turkey, duck breeders and commercial ducklings.

UNIT-II: Animal Husbandry (15 Periods)

2.1 Introduction to dairy farming in India and its present and future prospects

2.2 Dairy farm- Water supply, Light, Ventilation, Drainage system, Maintenance of recycling of waster and hygienic conditions of farm

2.3 Study of general management practices of animals: Grooming, Drying off, control of bad habits, castration, deworming, trimming

2.4 Cattle and Buffalo management – Calf raising, management of pregnant, partiurient, lactating and dry cows, buffalos and breading bull, summer management of buffalo

2.5 Sheep and Goat management – Management of Lambs and kids, Management of pregnant, parturient and lactating doe, General management practices of pigs

Suggested Readings:

1. Poultry Science and practice – Nilotpal Ghosh, CBS publisher
2. Poultry production and Management - Jagadeesh Prasad, Kalyani publisher
3. A text book of Animal husbandry – C. C. Banjer Joe, IBH publishing
4. A text book of Animal husbandry – S. K. Kaushish, Kalyani publisher

B.Sc. ZOOLOGY II YEAR
SEMESTER- IV
PAPER-IV(SEC-3): VERMICULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: **(15 Periods)**

1.1 Scope of vermi technology- Vermiculture and vermi composting – difference between vermiculture and vermi composting –
1.2 Earthworm diversity – Ecological groups of earthworms, biology of composting earthworms – Eoisena foeitida, Eudrilus lugeniae.
1.3 Soil – Physical, chemical and biological features
1.4 Organic waste sources – problems in traditional composting, vermi compositing
1.5 Types small and large scale pit method, heap method.

UNIT-II: **(15 Periods)**

2.1. Vermiculture techniques – vermi culture process – site selection - Selection and collection of species mono and poly culture
2.2. Essential parameters for vermi culture – bedding. Methods of harvesting worms general manual methods, self harvesting method, mechanical method
2.3. Nutritive value of vermi compost, storing and packing of compost
2.4. Applications of vermi composting in agricultural and horticultural practices
2.5. Economic of vermi culture, nationalized bank, NABARD support for vermi culture.

References:

1. Earthworm ecology by LEE
2. Biology of earthworm by Steven son
3. Vermi composting tech – soil health to human health by Ranganathan L.S.

B.Sc. ZOOLOGY III YEAR
SEMESTER - VI
PAPER – VI (SEC-III): VECTOR BIOLOGY

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

Unit-I: Vector Biology of Public Health Importance **(15 Periods)**

1.1 Introduction to vectors and vectors of human diseases – Public health nuisance.
1.2 Salient features and Life cycle of important Mosquito vector species – Anopheles, Aedes, Culex and Mansonia.
1.3 Salient features and life cycle of important other Dipteran vectors of public health Importance: Sandflies, Black files, House files and Myiasis causing files.
1.4 Life cycle and public health importance of
-Fleas and lice
1.5 Life cycle and public health importance of
-Ticks and Mites.

Unit – II: Basic sanitation and Public Health **(15 Periods)**

2.1 Basic sanitation – Hygiene and personal protection – Human wastes and Health – Solid waste and Waste water management.
2.2 Distinguishing characters of different species of human malarial parasites Life cycle and host Parasite interactions.
2.3 Distinguishing characters of different species of human Filarial parasites Life cycle and host parasite interactions.
2.4 Distinguishing characters of different arboviral diseases and their mode of transmission.
2.5 Control Measures – Source reduction.

B.Sc. ZOOLOGY II YEAR
SEMESTER- IV
PAPER-IV(SEC-4:) BIOMATERIALS FROM ANIMALS SOURCES

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: Biomaterials Introduction (15 Periods)

1.1 Introduction classification, Chemistry and characterization to biomaterial, biocompatibility with medical devices
1.2 Types of biomaterials degradable and reabsorbable materials, hydro gels and natural materials
1.3 Metallic biomaterial , ceramic biomaterials, composite for biomedical applications
1.4 Biomaterials and its applications – muscular skeletal systems
1.5 Delivery of drugs: for tissue engineering and regenerative medicine

UNIT-II: Biomaterials and their applications (15 Periods)

2.1 Collagen Definition, Types of Collagen, Structure of Collagen, Collagen Sources from Animal Origin Such as Bovine, Porcine, Marine and Fishes; Applications in Pharmaceutical, Tissue Engineering and Biomedical Industries.
2.2 Introduction to silk biomaterials: Silk fibroin and silk sericin proteins, molecular structure. Properties of silk fibroin: mechanical strength and biocompatibility. Spider dragline silk structure and properties, production from glands, spinning mechanism, Chemical Composition and Applications.
2.3 Structural Properties, Isolation and Processing Methods, Conversion of Chitin to Chitosan, Chemical and Biological properties; Bio Medical Applications.
2.4 Physico Chemical Properties, Structure, Synthesis Methods, Mechanism of Action, Physiological Function, Wound and Skin Repairs, Receptors of Hyaluronic Acid and Biomedical Applications
2.5 Introduction, elastin- structure, properties, Production from Various Sources, Biological Function and Biomedical Applications

Suggested Readings:

1. Biomaterial science: An introduction to materials in medicine, Buddy D. Ratner, et. al., Elsevier academic press 3rd edition.
2. Biomaterial compositor by Luigi Ambrobio 210 CRC press
3. Styata V. Bhat, Biomaterial 2nd edition, Naros Publishing House, New Delhi
4. Biological Materials Science, Biological Materials, Bioinspired Materials, and Biomaterials; Marc André Meyers, Po-Yu Chen.
5. Biomaterials, Medical Devices, and Combination Products; Biocompatibility Testing and Safety Assessment; Shayne Cox Gad, Samantha Gad-McDonald.
6. Biologically Responsive Biomaterials for Tissue Engineering. Iulian Antoniac.

B.Sc. ZOOLOGY II YEAR
SEMESTER – IV
PAPER-IV(SEC-4) – AQUACULTURE

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT-I: Aquaculture systems **(15 Periods)**

1.1 Concept of aquaculture. Culture systems: Freshwater culture: Prawn and fish culture in paddy fields; Brackish water culture; Mariculture: Culture of Oyster, Crab, Lobster, Mussel, Eels, aquatic weeds.

1.2 Definition and patterns of Composite fish culture in India. Techniques of composite culture. Culture of Catfishes and miscellaneous fishes.

1.3 Preparation and management of fish culture ponds: Nursery, Rearing, and Stocking ponds. Predatory and Weed fishes and their control using fish toxicants. Aquatic insects and their control.

1.4 Fertilization. Fish food organisms and their production. Supplementary feeding.

1.5 Transport of fish seed and Brood fish. Causes of mortality in transport. Methods for packaging and transport- Open and Closed systems. Use of chemicals, anesthetic drugs, antiseptics and antibiotics in live fish transport.

UNIT-II: Fish pathology and Technologies in Fisheries development **(15 Periods)**

2.1 Parasitic and Non-parasitic diseases; Fungal infections, Protozoan diseases, Worm diseases.

2.2 Fish breeding: Natural and artificial. Harvesting: Fishing techniques, preservation and processing of fish.

2.3 Fresh water prawn culture - Introduction. Breeding characteristics. Juvenile prawn migration. Seasonal & regional distribution of seeds. Identification of juveniles. Controlled breeding. Culture: Monoculture and Mixed culture in ponds. Role of hard water in culture of *Macrobrachium* species. Fertilization and feeds.

2.4 Pearl culture: Introduction, Pearl producing mollusks, pearl formation, collection and rearing of oysters, insertion of nucleus, harvesting, composition and quality of pearl.

2.5 Recirculation technology, Geographic Information System (GIS) technology, use of Information and Communication Technology (ICT) in fishes: production aspects, marketing aspects.

References:

1. Jingran, V.G. (1983). Fish and fisheries of India, Hindustan pub. Corp., New Delhi.
2. Hute, M. and Kahn, H. (2000). Textbook of fish culture, Blackwell Scientific Publication, Australia.
3. Srinivasulu, M., Reddy, K.R.S. Rao, S. (1999). Text book of Aquaculture, Discovery Publishing House, New Delhi.
4. Yawn Mehta, Fisheries & Aquaculture Biotechnology (2011). Campus Books International, Prahalad street, Ansari Road, Durga Ganj, New Delhi.

B.Sc. ZOOLOGY II YEAR
SEMESTER – IV
PAPER-IV(SEC-4) – AQUARIUM FISH KEEPING

Instructions: 2hr per week
No. of period: 30
No. of credits: 2

UNIT- I: Designing and preparation of aquaria with all accessories **(15 Periods)**

1.1 Importance, history and scope of aquarium fish keeping as a Cottage Industry.

1.2 Aquarium fabrication- shape, size, volume, type of glass tank, cutting of glass, preparation of glass tank, strengthening and supporting of tank; aquarium floor setting- type and size of pebbles, gravels, granites used for bed setting and its advantages.

1.3 Filters-biological, chemical and mechanical. Aquarium accessories like aerators, decorative, lighting, heating and feeding trays.

1.4 Water quality management in aquarium systems-sources of water, temperature, pH, dissolved oxygen, carbon dioxide, ammonia, hardness, turbidity.

1.5 Aquarium plants: Uses of different varieties of submerged plants tubers, rooted plants) and emerged plants.

UNIT- II: Biology, food & feeding and control of diseases of aquarium fishes **(15 Periods)**

2.1 Common characters and sexual dimorphism of common freshwater and marine exotic and indigenous species of aquarium fishes: Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish.

2.2 Food and feeding Use of live fish feed organisms (Artemia, Infusoria, Spirulina). Preparation and composition of formulated fish feed.

2.3 Brood stock management: Maintenance of breeding conditions- pH, temperature and sex ratio; Selective breeding and hybridization techniques, induced breeding, colour enhancement techniques.

2.4 Common diseases of aquarium fishes – their causative agents viz., virus, bacteria, fungi, protozoa and nematodes; symptoms, treatment and prophylactic measures.

2.5 Budget for setting up an Aquarium Fish Farm as a Cottage Industry.

References:

1. Hansen, J. (1979). Making your own aquarium. Bell and Hyman Ltd., London.
2. Axelord, H.R. (1967). Breeding aquarium fishes, T F H Publications.
3. Lovell, T. (1998). Nutrition and feeding of fish. Second Ed. Kluwer Academic publishers.
4. Mills, D. and Vevers, G. (1982). The Practical encyclopedia of fresh water, Tropical Aquarium fishes, Salamander Books Limited, London.
5. Brunner, G. (1973). Aquarium plants, T F H Publications Inc. Ltd., Hongkong.
6. Mills, D. (1981). Aquarium Fishes, Arco publishing.
7. Gahlawat, S.K., et. al. (2007). Manual of experimental Ichthyology, Daya publishing House, Delhi.
8. Talwar, P.K., and Jhingran, A.G. (1991). Inland fishes. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

B.Sc. ZOOLOGY III YEAR
SEMESTER – V
PAPER-V (DSE – I): PHYSIOLOGICAL CHEMISTRY AND ENDOCRINOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Biomolecules of Importance **(15 Periods)**

1.1 Types of biomolecules –Carbohydrates,Proteins ,Lipids,Nucleic acids and their significance in biological systems.
1.2 Classification of protein; Function of proteins based on their chemical nature
1.3 Protein metabolism: Transamination, deamination, urea cycle
1.4 Classification and function of carbohydrates
1.5 Carbohydrate metabolism: Glycolysis, Kreb's cycle, electron transport and oxidative phosphorylation

UNIT-II: Lipids and enzyme Classification **(15 Periods)**

2.1 Lipids: nomenclature and classification of lipids
2.2 Fatty acid synthesis and beta oxidation of lipids
2.3 Cholesterol synthesis and metabolism of steroidal hormones
2.4 Enzyme definition, nomenclature, classification and Enzyme kinetics, Lineweaver-Burk plot
2.5 Mechanism of enzymes: Action, enzyme inhibition, coenzymes

UNIT - III: Introduction to Endocrinology **(15 Periods)**

3.1 Concept and Scope of endocrinology; Hormones as chemical messengers.
3.2 Classification of hormones
3.3 Mechanism of action of aminoacid derivatives, peptide hormones and steroid hormones.
3.4 Positive feedback mechanism and Negative feedback control
3.5 Concept of internal environment and homeostasis.

UNIT - IV: Endocrine Glands and their Hormones **(15 Periods)**

4.1 Hypothalamus and its Hormones.
4.2 Structure, hormones and functions of Pituitory gland.
4.3 Structure, hormones and functions of Thyroid, Parathyroid, thymus
4.4 Structure, hormones and functions of Adrenal, Pancreas, Pineal,
4.5 Hormones and reproduction

REFERENCE BOOKS:

1. Text book of biochemistry
2. Text book of biochemistry
3. Text book of physiology and biochemistry
4. Text book of biochemistry
5. Molecular cell biology
6. Comparative Endocrinology of Invertebrates by Highman and Hill.
7. Comparative Vertebrate Endocrinology by P.J.Bentley, Cambridge Univ. Press
8. Text Book of Endocrinology by Turner and Bangnara (W.B.Sanders)
9. Essential Endocrinology by Joen Laycock and Peter Loise Oxford Univ. Press.
10. Text Book of Endocrinology by R.H.Williams (W.B.Saunders).

B.Sc. ZOOLOGY III Year PRACTICAL SYLLABUS
SEMESTER – V
PAPER-V (DSE – I): PHYSIOLOGICAL CHEMISTRY AND ENDOCRINOLOGY

Instructions: 3hr per week
No. of credits: 1

1. Identification of carbohydrates –Molisch test,Benedict's/Fehling's test,Iodine test,Barfoed's test.
2. Identification of proteins-Biuret test,Sodium hydroxide test
3. Identification of amino acids-Xanthoproteic test,Nin-hydrin test,Millon's test.
4. Identification of lipids-Sudan-IV test.
5. Histology of Endocrine glands, Pituitory, Thyroid, Parathyroid, Thymus, Adrenal Pancreas, Ovary & Testis, Uterus.
6. Effect of Eye Stalk ablation on Blood Glucose levels in Crabs.
7. Identification of Gonadotrophin in Human urine samples.
8. Effect of Thyrosine and thiourea (antithyroid agent) on oxygen consumption in fish.

- Laboratory record work shall be submitted at the time of practical examinations
- Computer-aided techniques shall be adopted as per UGC guidelines

B.Sc. III Year
SEMESTER-V,
Paper – V (DSE – I): LABORATORY ANIMALS MAINTENANCE AND APPLICATIONS

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT I: Introduction to Laboratory Animals& Animal Care (15 Periods)

1.1 Laboratory Animals – Introduction; Species of Laboratory Animals; Laboratory Animals for Research; Genetically Modified Laboratory Animals
1.2 Animal Experimentations – Implications; Principles, LaboratoryAnimals and Models of Human Diseases, Results of Animal Experimentations
1.3 Animal Care – Animal Ethics; ethical theories –Virtue ethics, Humean Theory, Utilitarian Theory, Capabilities Theory, Persons Theory
1.4 Animal Care – Regulations and Policies; Prevention of Cruelty to Animal Act, 1960; Breeding of and Experiments on Animals (Control and Supervision) Rules, 2006
1.5 Animal Care – CPCSEA, Standard Operating Procedures (SOP) for IAEC; CPCSEA Guidelines for Laboratory Animal Facility

UNIT II: Maintenance, Quality Control & Welfare of Laboratory Animals (15 Periods)

2.1 Environment and Facilities of Laboratory Animals for Terrestrial Animals and Aquatic Animals
2.2 Nutrition and Animal Experimentation – Nutrients, energy, nutritional needs, animal feeds
2.3 Genetic Standardization of Laboratory Animals – Animal Breeding System; Inbred strains; Strains Made from Multiple Inbred Strains; F1 Hybrids, Outbred Strains and Closed Colonies; Genetic Quality Control
2.4 Microbiological Standardization of Laboratory Animals – Reasons, causes, zoonosis; Contamination sources and routes of transmission
2.5 Concept of Animal Welfare – Origin and Connotation; Concept of Stress, Pain, and Distress in Laboratory Animals; Humane End Points of Animal Experiments

UNIT III: Management & Husbandry of Laboratory Animals (15 Periods)

3.1 Management of Laboratory Animals – Introduction, Laboratory Animal Welfare and controversy of animal experimentation
3.2 Alternative Methods of Animal Experimentation - 3Rs Theory;Protocol of animal experimentation
3.3 Laboratory Management and Husbandry – Mice: general biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording
3.4 Laboratory Management and Husbandry - Ratsgeneral biological characteristics including anatomy and physiology; sexual differentiation, health features, cages and housing; husbandry and recording
3.5 Laboratory Management and Husbandry – Fishes; general biological characteristics including anatomy and physiology; health features, water system, water management, feeding

UNIT IV: Applications of Laboratory Animals (15 Periods)

4.1 Animal Models – Need, Classification and Selection of animal models
4.2 Animal Models – Types: Induced AM, Spontaneous AM, and Genetically Modified AM
4.3 Applications in biomedical research –systemic diseases, transplantation studies, studies on embryogenesis and developmental biology
4.4 Applications in behavioural research – neurological responses, behavioural changes, brain function, acclimatization studies
4.5 Applications in toxicology and drug research – safety testing of pesticides, medications, food additives; cosmetic testing; drug testing: metabolic tests, toxicology tests

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS 2019-20

B.Sc. III Year PRACTICAL SYLLABUS

SEMESTER-V, DSE – I
Paper – V
LABORATORY ANIMALS MAINTENANCE AND APPLICATIONS

Instructions: 3hr per week
No. of credits: 1

1. Mounting zooplanktons for microscopic viewing
2. Demonstration of microscopic drawings of zooplanktons
3. SDH or LDH activity using colorimeter
4. Demonstration of ELISA using kit
5. Measurements of soil characteristics – temperature, pH, humus content and moisture content
6. Measurement of physico-chemical parameters of water – temperature, pH, oxygen levels, alkalinity
7. Exercise on data collection, tabulation and preparation of graphs
8. Calculation of averages (mean, median, mode) and standard deviation
9. Calculation of difference in means using Student's t Test

- **Laboratory record work shall be submitted at the time of Practical Examination.**
- **Computer-aided teaching material too can be used for these experiments as per UGC guidelines**

B.Sc. ZOOLOGY III YEAR
SEMESTER-V
PAPER – V(DSE – I): IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Basics of Immune system **(15 Periods)**

1.1 Cells of the immune system and the lymphoid organs(Primary and secondary).
1.2 First line of defenses-physical and chemical barriers; second line of defenses- inflammation and phagocytosis.
1.3 Types of immunity-Inherent(Active and passive) and acquired immunity(Active and passive) Humoral and cell mediated immunity
1.4 Major histocompatibility complex (MHC)–structure and function of class I and class II proteins.
1.5 Significance of MHC in organ tranaplantation.MHC restriction

UNIT-II: Antibodies and Antigens and Immune system diseases **(15 Periods)**

2.1 Antibodies/immunoglobulins- structure, functions and classification, antibody diversity, Monoclonal antibodies and applications.
2.2 Antigens structure, antigenic determinants/epitopes, haptens, adjuvants and antigenicity.
2.3 Antigen-antibody reactions-agglutination, precipitation, opsonization, cytotoxicity
2.4 Hypersensitivity reactions
2.5 Autoimmunity and Immunodeficiency diseases.

UNIT – III: Animal Biotechnology and Genetically modified organisms **(15 Periods)**

3.1 Concept and Scope of Animal Biotechnology.
3.2 Recombinant DNA technology and its applications.
3.3 Cloning vectors - Plasmids, Cosmids and shuttle vectors; Cloning methods (Cell, Animal and Gene cloning).
3.4 Transgenesis – Methods of Transgenesis.
3.5 Production of Transgenic animals - sheep and fish.

UNIT –IV: Applications of Biotechnology **(15 Periods)**

4.1 In vitro fertilization and embryo transfer.
4.2 Hybridoma technology – concepts and applications.
4.3 Stem cells –types and their applications.
4.4 Biopesticides; *Bacillus thuringiensis* – mode of action of toxin.
4.5 Animal Bioreactors – concepts and applications.

Reference Books:

1. Text book of immunology-Ivan Riott
2. Text book of immunology-C.V.Rao
3. Text book of immunology-Nandini shetty
4. Text book of immunology-Kubey
5. Culture of Animal cells. R. Ian Freshney, Wiley Liss.
6. Biotechnology – S. Mitra.
7. Animal Cell culture – Practical Approach – Ed. John R W Masters, Oxford.
8. Biotechnology – B. D. Singh

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER-V
PAPER – V(DSE – I): IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

Instructions: 3hr per week
No. of credits: 1

I. Immunology

1. Demonstration of agglutination(ABO-blood grouping/Widal test) using kit
2. Demonstration of precipitation(VDRL/RPR test)using kit
3. Radial immunodiffusion using kit.
4. Histology of lymphoid organs-Spleen, Thymus, Lymphnode, Bone marrow.

II. Animal Biotechnology

1. Study the following techniques through photographs / virtual lab
   a. Identification of Vectors
   b. Identification of Transgenic animals
   c. DNA sequencing (Sanger's method)
   d. DNA finger printing
   e. Southern blotting
   f. Western blotting

2. PCR demonstration /virtual lab

- **Laboratory Record work shall be submitted at the time of practical examination**
- **Computer aided techniques should be adopted as per UGC guide lines.**

Reference Books:

1. A hand book of practical immunology-Ivan Riott
2. Animal Biotechnology – PK Gupta

B.Sc. ZOOLOGY III Year
SEMESTER – V
PAPER – V (GE-I): PREVENTIVE MEDICINE

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: -Man and Medicine: Health for all **(15 Periods)**

1.1. Antiquity medicine, types of medicine.
1.2. Dawn of scientific medicine, modern medicine – curative medicine, preventive medicine and social medicine.
1.3. Definition of health, dimensions of health – Physical, Mental, Social Spiritual, Emotional and Vocational health,
1.4. Determinants of health – Biological, Behavioural, Environmental, Socio-economic and Health services
1.5. Concept of well being – Standard of living, Level of living and quality of life.

UNIT-II: Principles of Epidemiology **(15 Periods)**

2.1. Definition of epidemiology, measurements in epidemiology- rates, ratio and proportion.
2.2. Epidemiologic methods- observational and experimental studies.
2.3. Uses of epidemiology and definitions of infectious disease epidemiology.
2.4. Dynamics of disease transmission – source and reservoirs.
2.5. Epidemiological triad, modes of disease transmission – direct and indirect.

UNIT-III: Concept of Disease causation **(15 Periods)**

3.1. Germ theory of Diseases
3.2. Disinfection- types of disinfection
3.3. Immunity- Active Immunity, Passive immunity, immunizing agents.
3.4. Nutrition and Health – Classification of foods; Nutritional requirements.
3.5. Screening of disease – uses of screening, types of screening.

UNIT-IV: Concepts of control & prevention **(15 Periods)**

4.1. Health care of the community – health care systems, levels of health care.
4.2. Modes of health interventions: Health Promotion, Specific Protection, Early Diagnosis and Treatment, Disability Limitations, and Rehabilitations.
4.3. Concepts of control - Monitoring and Surveillance.
4.4. Concepts of Prevention- Primary, Secondary & Tertiary.
4.5. Health programmes in India.

References:

1. Park's Textbook of Preventive and Social Medicine.

B.Sc. ZOOLOGY III YEAR
SEMESTER – V
PAPER – V (GE-I): INTEGRATED PEST MANAGEMENT

Instructions: 4 hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Pest **(15 Periods)**

1.1 Introduction, History and origin
1.2 Definition of pest and its ecology
1.3 Pest, population dynamics
1.4 Economic injury level (EIL), Economic threshold
1.5 Pest surveillance

UNIT-II: Integrated Pest Management **(15 Periods)**

2.1 Concepts of IPM
2.2 Components of IPM
2.3 Major IPM strategies
2.4 Strategies for IPM Mechanical, Physical, Cultural and Biological

UNIT-III: Biological and Genetic Control **(15 Periods)**

3.1 Introduction and Principle
3.2 Bio control agents
3.3 Parasitoids, predators and pathogens (NPV, Bacteria, fungi and nematodes)
3.4 Merits and demerits
3.5 Genetic Control – sterile insect technique; sterile insect release method

UNIT-IV: Chemical Control **(15 Periods)**

4.1 Classification of insecticides
4.2 Insecticide adjuvant and formulation
4.3 Chemical control with reference to organo chloride, organophosphate carbamates
4.4 Synthetic pyrethroids; fumigants; pheromones legal or regulatory control- Quarantine acts

REFERNCES

1. K.P.Srivastava: A Text Book of applied EntomologyVol.i&ii.Kalyani Publishers New Delhi.
2. B.V.David and KumaraSwamy. Elements of Economic Entomology
3. B.V.David and KumaraSwamy.Elements of Economic Entomology
4. Pedigo,L.P.Entomology and Pest Management .Prentice-Hall ,New Delhi
5. Pradhan,S. Insect Pests of Crops, National Book Trust,New Delhi
6. Agricultural Pests of India and South East Asia by Atloal A.S. Kalyani Publisher, New Delhi
7. Insect Pest of Crops by S. Pradhan, National Book Trust, New Delhi

B.Sc. ZOOLOGY III YEAR
SEMESTER – VI
PAPER- VI (DSE-II): FISHERIES AND LIMNOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT-I: Introduction to Fisheries, aquaculture systems, management practices (15 periods)

1.1 Introduction, definition, history, scope and significance of 'Fisheries'. Present status and prospects of Fisheries at global, national and local (state) level. Blue revolution.

1.2 Classification of Fisheries.
- i) Fin fisheries & Shell fisheries;
- ii) Capture fisheries & Culture fisheries;
- iii) Freshwater (inland), Brackish water & Marine fisheries.

1.3 Aquaculture systems: Pond culture, pen culture, cage culture. Monoculture, composite culture, integrated culture systems.

1.4 Culture phases and management practices: Nursery, rearing and grow-out pond preparation. Liming, fertilization/manuring, and water quality management. Control of aquatic weeds, algal blooms, and weed fishes.

1.5 Traits of important cultivable finfish and shellfish: Indian major carps and Minor carps, Exotic carps, air breathing fishes, cold water fishes, fresh water prawns, mussels.

UNIT-II: Feeding, Breeding and hatchery management of finfish and shellfish (15 periods)

2.1 Bundh breeding: Concept; wet and dry bundhs; Collection and hatching of eggs.

2.2 Induced breeding: Environmental factors affecting spawning; Hypophysation of fishes; Fish pituitary gland: Structure, collection, preservation, and preparation of extract for injection, dosages and methods of injection, dosages and methods of injection.

2.3 Brood-stock management and transportation of brood fish. Synthetic hormones are used for induced breeding of carps.

2.4 Types of fish hatcheries: Traditional, Chinese, Glass jar, Modern controlled hatcheries. Breeding and hatchery management of *Penaeus monodon* and *Macrobrachium rosenbergii.*

2.5 Fish nutrition: Natural and supplementary feeding of cultivable finfish and shellfishes. Forms of feeds: Wet feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets.

UNIT-III: Limnology (15 periods)

3.1 Introduction to limnology, Inland water bodies: Characteristics and distribution of Ponds, Lakes, Reservoirs, Streams and Rivers.

3.2 Dynamics of lentic and lotic environments.

3.3 Major rivers and fresh water lakes of India. Origin, classification and morphometry of lakes.

3.4 Influence of physical and chemical conditions on living organisms in inland waters- Temperature, Light, pH, Turbidity, Thermal stratification, Dissolved Oxygen (DO), Alkalinity, Acidity, Hardness, BOD, COD etc.

3.5 Major groups of organisms in freshwater bodies: Planktons, Periphytons, Neustons, Nektons, Benthos, large aquatic plants etc. Ecological adaptations of freshwater fauna.

UNIT-IV: Productivity of lakes (15 periods)

4.1 Ecology of ponds and lakes (Lentic ecosystems) – Structure and dynamics – Energy flow.

4.2 Productivity of water bodies: Concept of productivity, primary, secondary and tertiary productivity. Factors affecting productivity. Classification of lakes based on productivity.

4.3 Laws of minimum and quantitative relationships in a standing crop.

4.4 Biotic potential and environmental resistance. Succession phenomenon and indices of productivity of lakes.

4.5 Eutrophication – causes, consequences and control mechanisms.

Reference Books:

1. Goldman CR. And Home AJ. 1983. Limnology. Mc Graw – Hill International Book Company.
2. Ruttner F. 1953. Fundamentals of Limnology. University of Toronto press, Toronto.
3. Welch PS, 1952. Limnology, 2nd Ed. Mc Graw-Hill Book Co., New York.
4. Golterman, HL. 1975. Physiological Limnology. Elsevier Publishing Co., Amsterdam
5. Cole GA. 1983. Text book of Limnology. C.V Mosby Company, St. Louis, Missouri, USA.
6. Wetzel RG. 1975. Limnology. W.B. Sanders Company, Philadelphia.

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER – VI
PAPER-VI (DSE-II): FISHERIES AND LIMNOLOGY

Instructions: 3hr per week
No. of credits: 1

1. Aquaculture production statistics – World, India, and Telangana state.
2. Aquaculture resources of the World, India, and Telangana state.
3. Histological studies of testis, ovary of fish.
4. Identification of important cultivable fresh water fishes-Indian major carps, exotic carps, mahaseers, trouts, tilapias, catfishes, murrel fish.
5. Removal of fish pituitary gland and preparation of pituitary gland extract.
6. Morphometry of lakes, ponds and streams.
7. Determination of physical and chemical characteristics of lotic and lentic water bodies: Temperature, transparency, turbidity, pH, electrical conductivity, salinity, total dissolved solids, dissolved oxygen, free carbondioxide, total alkalinity, total hardness, calcium, magnesium, inorganic nitrogen(ammonium and nitrate) and phosphorous.
8. Collection and identification of fresh water Phytoplankton.
9. Collection and identification of fresh water Zooplankton.
10. Estimation of primary productivity in fresh water bodies.
11. Field trip to local or nearby fisheries unit/fresh water body is to be conducted and certified field note book should be submitted at the time of practical examination.

References:

1. Ayyappan, S., 2011. Handbook of Fisheries and Aquaculture, ICAR Publications, New Delhi.
2. Rath, R.K., 2011. Freshwater Aquaculture, Scientific publications.
3. Santhanam, R., Sukumaran, N. and Natarajan, P. 1987. A manual of Aquaculture. Oxford-IBH, New Delhi.
4. Ramanathan, N. and Francis T., 1996. Manual on breeding and larval rearing of cultivable fishes, Fisheries College and Research Institute, Tuticorin.
5. Jhingran, V.G., Pullin, R.S.V., 1997. A hatchery manual for the Common, Chinese and Indian Major Carps. Asian Development Bank, International Centre for living Aquatic Resources Management, Philippines.

B.Sc. ZOOLOGY III YEAR
SEMESTER-VI
PAPER – VI (DSE-II): ECOLOGY, ZOOGEOGRAPHY AND EVOLUTION

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT – I: **(15 Periods)**

1.1 Ecology - I

1.1 Ecosystem structure and functions.Types of Ecosystems –Aquatic and Terrestrial.
1.2 Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water.
1.3 Energy flow in ecosystem.
1.4 Food chain, food web and ecological pyramids.
1.5 Animal Associations - Mutualism, commensalism, parasitism, competition, predation

UNIT – II: **(15 Periods)**

2.1 Ecology - I

2.1 Concept of Species, Population dynamics and Growth curves.
2.2 Community Structure and dynamics and Ecological Succession.
2.3 Ecological Adaptations.
2.4 Environmental Pollution – Sources, Effect and Control measures of Air, Water, Soil and Noise Pollution.
2.5 Wildlife conservation - National parks and Sanctuaries of India, Endangered species.

UNIT – III: **(15 Periods)**

3.1 Zoogeography

3.1 Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities
3.2 Wallace line, Discontinuous distribution
3.3 Continental Drift
3.4 Biodiversity and hotspots of Biodiversity in India.

UNIT – IV: **(15 Periods)**

4.1 Evolution

4.1 Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory.
4.2 Evidences of Evolution. Causes and Role of Extinction in Evolution.
4.3 Forces of Evolution – mutation, gene flow, genetic drift, and natural selection. Hardy Weinberg Law
4.4 Isolation – Pre-mating and post mating isolating mechanisms
4.5 Speciation: Methods of speciation - Allopatric and sympatric

Suggested Readings:

1. **M.P.Arora**, *'Ecology'* Himalaya Publishing company.
2. **P.D.Sharma**, *Environmental Biology'*.
3. **P.R.Trivedi and Gurdeep Raj**. *'Environmental Ecology'*
4. **Buddhadev Sarma and Tej Kumar**, *Indian Wildlife Threats and Preservation*
5. **Chapman J.L. and Reiss M.J,** *Ecology Principles and Applications*, Second
6. Ed., Cambridge University Press, London.
7. **Benny Joseph,** *Environmental Studies*, TATA MGraw Hill Com., New Delhi.

8. **Eugene P. Odum**, *Fundamentals of Ecology* Third Ed., NataraJ Publishers, Dehradun.
9. **Veer Bala Rastogi**, "Ecology and Animal Distribution"
10. **P.K. Gupta**, "Text Book of Ecology and Environment"
11. **Bhatnagar and Bansal**, "Ecology and Wildlife biology
12. **Ridley, M. (2004).** *Evolution*. III Edition. Blackwell Publishing
13. **Douglas, J. Futuyma (1997).** *Evolutionary Biology*. Sinauer Associates.
14. **Minkoff, E. (1983).** *Evolutionary Biology*. Addison-Wesley.
15. **Jan M. Savage**. *Evolution*, 2nd ed, Oxford and IBH Publishing Co., New Delhi.

B.Sc. ZOOLOGY III YEAR PRACTICAL SYLLABUS
SEMESTER- VI
PAPER – VI (DSE-II): ECOLOGY, ZOOGEOGRAPHY AND EVOLUTION

Instructions: 1hr per week
No. of credits: 2

1. Determination of pH of Soil and Water
2. Estimation of salinity (chlorides) of water in given samples.
3. Estimation of Carbonates and bicarbonates in the given water samples.
4. Estimation of dissolved oxygen of pond water, sewage water and effluents.
5. Identification of Zooplankton from a nearby water body.
6. Study of Pond Ecosystem / local polluted site - Report submission
7. Study of at least 3 endangered or threatened wild animals of India through photographs / specimens / models
8. Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.
9. Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.
10. Museum Study of Fossil animals: *Peripatus, Coelacanth Fish, Dipnoi fishes, Sphenodon, Archeopteryx*.
11. Study of homology and analogy from suitable specimens and pictures
12. Problems on Hardy-Weinberg Law
13. Macroevolution using Darwin finches (pictures)

Laboratory Record work shall be submitted at the time of practical examination

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

1. **Robert Desharnais,Jeffrey Bell,** 'Ecology Student Lab Manual, Biology Labs'
2. **Darrell S Vodopich,** 'Ecology Lab Manual'

OPTIONAL PAPER IN PLACE OF THE PROJECT
B.Sc. ZOOLOGY III YEAR
SEMESTER - VI
PAPER – VI: TOOLS AND TECHNIQUES IN BIOLOGY

Instructions: 4hr per week
No. of period: 60
No. of credits: 4

UNIT- I: Microscopy Centrifugation (15 Periods)

1.1 Microscopy – Basic principle of microscopy, types of microscopes and their application
1.2 Histopathological techniques – principle and its applications
1.3 Centrifugation –Basic principle of centrifugation; Preparatory and analytical centrifugation techniques and its applications

UNIT- II: Separation techniques (15 Periods)

2.1 Colorimetery and Spectrophotometry – Basic principle of colorimetry and its applications, Basic principle of spectrophotometry, and applications.
2.2 Chromatography – Basic principle of chromatography; Types of chromatography techniques and their applications
2.3 Electrophoresis – Basic principle of electrophoresis and their applications

UNIT- III: Advanced techniques (15 Periods)

3.1 Immuno assay-Principle and applications of ELISA
3.2 PCR Techniques – DNA extraction and isolation; Principles and applications of PCR techniques
3.3 RIA and its applications

UNIT- IV: Statistical tools (15 Periods)

4.1 Data – Definition and types of data, Concept of variables; Summarising data: averages (mean, median, mode), dispersion (range, standard deviation, confidence limits);
4.2 Representing data – Arraying data, tabulation; graphical representation of data (histogram, bar graph, line graph, scatter plot, pie diagram)
4.3 Non-parametric tests –Chi Square test and Parametric tests –Correlation; Student's t-Test; Regression analysis

Reference Books

1. Gurumani, N. An Introduction to Biostatistics. MJP Publisher, Chennai
2. Gurumani, N. Research Methodology. MJP Publishers, Chennai
3. Tembhare, D.B. Techniques In Life Sciences, Himalaya Publishing House, Delhi

CHAIRMEN
Board of Studies in Zoology,
Osmania University, Hyd-07

Dr. B. Bhima, Ph.D., PDF (USA)
Assoc. Prof. & Chairman, BoS
PI - SERB-YSS, SERB & UGC Projects
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Date: 17/06/2020

To

The Dean

Faculty of Science

Osmania University, Hyderabad.

Sub: Submission of Re-Structured Syllabus of B.Sc. Microbiology (CBCS). Reg.

Sir,

With reference to the subject cited, I am herewith sending one copy of B.Sc. (CBCS) modified new syllabus of all semesters for your kind perusal. The syllabus is prepared according to the given template of UGC for 150 credits.

Thanking you,

Yours sincerely,

(Dr. B. Bhima)

Chairman, Board of Studies

Department of Microbiology, UCS, O.U.

Dr.B.Bhima
Chairman.BoS
Dept.of Microbiology
Osmania University,Hyd.

1- 24 Pages

Telangana State Council of Higher Education, Govt.of Telangana
(Osmania University)
PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN B.Sc.
MICROBIOLOGY (2020-21)

Code	Course Title	Course Type	HPW	Credits
FIRST YEAR-SEMESTER-1				
BS	AEC-1			2
BS	English			4
BS	Second Language			4
BS	**General Microbiology**	DSC-1A	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-2				
BS	AEC-2			2
BS	English			4
BS	Second Language			4
BS	**Microbial Diversity**	DSC-1B	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SECOND YEAR-SEMESTER-3				
BS	**Haematology**	SEC-1	2	2
BS	**UGC Given**	SEC-2		2
BS	English			3
BS	Second Language			3
BS	**Food & Environmental Microbiology**	DSC-1C	4+2	5
BS	Optional-II			5
BS	Optional-III			5
SEMESTER-4				
BS	**Mushroom Cultivation**	SEC-3	2	2
	UGC Given	SEC-4		2
	English			3
BS	Second Language			3
BS	**Medical Microbiology & Immunology**	DSC-1D	4+2	5
BS	Optional-II			5
BS	Optional-III			5
THIRD YEAR-SEMESTER-5				
	English			3
	Second language			3
BS	**Microbiology and Human Health**	GE	4	4
BS	**1A.Molecular Biology & Microbial Genetics** **or** **1B. Microbial Omics**	DSE-I	3+2	5
BS	Optional-II			5
BS	Optional-III			5

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SEMESTER-6				
BS	English			3
BS	Second language			3
BS	**2.A Industrial Microbiology** **2.B Pharmaceutical Microbiology**	DSE-2	4+2	5
BS	**PROJECT WORK / Applied Microbiology**		3+2	4
BS	Optional-II-A/B/C			5
BS	Optional-III-A/B/C			5
Total				**150**

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Syllabus for B.Sc Microbiology **Code: BS, DSC- 1A**

B.Sc I year: I Semester

Title: GENERAL MICROBIOLOGY **4HPW -Credits-4**

UNIT-1: INTRODUCTION TO MICROBIOLOGY

Meaning, definition and scope. History of microbiology: Contribution of Louis Pasteur and Robert Koch. Importance and application of Microbiology.

Principles of Microscopy-Bright field, Dark field, Phase-contrast, Fluorescent and Electron microscopy (SEM and TEM). Principles and types of stains-simple stain, differential stain, negative stain.Structural stain-spore, capsule, flagella.Bacterial motility - Hanging drop method.

UNIT-2: STRUCTURE OF BACTERIA, VIRUSES & PURE CULTURE CONCEPT

Prokaryotes - Ultra structure of eubacteria.

General characteristics and classification of virus.

Morphology and structure of TMV and HIV. Structure and multiplication of lambda bacteriophage.

Isolation of pure culture techniques- Enrichment culturing, Dilution plating, streak plate, spread plate, Micromanipulator. Preservation of Microbial cultures – Sub culturing, overlaying cultures with minerals oils, lyophilization, sand cultures, storage at low temperature.

UNIT-3: MICROBIAL NUTRITION AND METABOLISM

Microbial Nutrition – Nutritional requirement, Uptake of nutrients by cell. Nutritional groups of microorganisms – Autotrophs, Heterotrophs, Mixotrophs. Components and types of bacterial growth media – simple and complex media.

Respiration – Glycolysis, HMP Pathway, ED Pathway , TCA Cycle and Anaplerotic reaction, Electron Transport, Oxidative and substrate level phosphorylation.

UNIT-4: STERILIZATION TECHNIQUES AND MICROBIAL GROWTH

Sterilization and disinfection techniques - Physical methods- Autoclave, Hot air oven, Laminar air flow, Filter sterilization. Radiation methods - U.V rays, Gamma rays, Ultrasonic methods. Chemical methods - Alcohols, Aldehydes, Phenol, Halogens and Hypochlorides.

Microbial growth – Different Phases of Growth in Batch culture. Factors Influencing microbial growth. Synchronous, Continuous, Biphasic Growth. Methods for measuring microbial growth – Direct Microscopic, Viable count, Turbidometry, Biomass.

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References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harly, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube, R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.
5. Anthanarayan and Panicker, Medical Microbiology.

General Microbiology

PRACTICALS

2HPW-Credits-1

- Handling and calibration of light microscope.
- Simple and differential staining (Gram staining), Spore staining.
- Microscopic observation of cyanobacteria (Nostoc,Spirulina), algae and fungi (Saccharomyces, Rhizopus, Aspergillus, Pencillium, Fusarium).
- Isolation of T2 bacteriophage from sewage sample.
- Preparation of media for culturing autotrophic and heterotrophic microorganisms – algal medium, mineral salts medium , nutrient agar medium, McConkey agar and blood agar.
- Sterilization techniques: Autoclave, Hot air oven and filtration.
- Enumeration of bacterial numbers by serial dilution and plating (viable count)
- Isolation of pure cultures by streak, spread and pour plate techniques
- Preservation of microbial cultures- Slant, Stab, Sand cultures, mineral oil overlay and glycerol stocks
- Turbidometric measurement of bacterial growth and plotting growth curve.

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.

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Syllabus for B.Sc Microbiology **Code: BS, DSC-1B**

B.Sc I year: II Semester

Title: MICROBIAL DIVERSITY **4HPW- Credits-4**

UNIT 1: CONCEPT OF BIODIVERSITY

Basic concept of Biodiversity and Conservation. Elements of Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance & Diversity. Economic Value of Biodiversity & Legal, Ethical and Conservation issues related to uses of biodiversity.
Classification of living organisms; Haeckel, Whittaker and Carl Woese systems. Differentiation of prokaryotes and eukaryotes.
Classification of bacteria as per the second edition of Bergey's manual of systematic bacteriology.

UNIT 2: PROKARYOTIC MICROBIAL DIVERSITY

General characteristics of eubacteria, Rickettsia and Mycoplasma.
Microbial richness: Exploration, significance, conservation and applications. Structural and physiological diversity of Archaea bacteria, Metabolic characteristics of extremophiles (Methanogens, Halophiles, thermoacidophiles).
Gram negatives: Cyanobacteria and Proteobacteria, Gram positives and heterogenous members including Firmicutes, Actinobacteria, Bacteroidetes, Acidobacteria and Planctomycetes

UNIT 3: EUKAROTYIC MICROBIAL DIVERSITY

Eukaryotic microbial diversity. Structural, physiological and metabolic characteristics, of Algae - Cyanophyta, Chlorophyta Bacillariophyta, Phacophyta, Rhodophyta; Fungi -Phycomycetis, Basidiomycetis, Zygomyetes, Oomycets, Asomycetes, Deuteromycetes (imperfect and perfect stages) and Protozoa - Giardia, Entamoeba and Plasmodium.

UNIT 4: MICROBIAL ECOSYSTEMS

Microbial interactions: Symbiosis, neutralism, commensalism, competition, antagonism, synergism, parasitism.
Understanding microbial diversity with Cultivated vs Uncultivated microorganisms.
The Great Plate count anomaly . Cultivation independent methods to assess microbial diversity.
Preserved and perturbed microbial ecosystems, microbiome for sustainable agroecosystems, Human microbiome

References:

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig.N.R (2006)."Microbiology"- 5th Edition McGraw Hill Inc. New York.
2. David, B.D., Delbecco,. R., Eisen, H.N and Ginsburg, H.S (1990) "Microbiology" 5th Edition. Harper & Row, New York.

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3. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R. (1986). "General Microbiology" - Mac Milan Education Ltd. London.
4. Brown J.W. (2015) Principles of Microbial Diversity, ASM Press
5. Epstein S.S. (2009) Uncultivated microorganisms, Springer-Verlag Publishers
6. Madigan M.T., Bender K.S., Buckley D.H., Sattley W.M. and Stahl D.A. (2017) Brock Biology of Microorganisms, 15th Edn. (Global Edn.)Pearson Education

MICROBIAL DIVERSITY

PRACTICALS

2HPW-Credits-1

- Isolation of Methanogenic bacteria from manure by anaerobic culturing
- Isolation and enumeration of halophiles from saline environment
- Isolation of bacteria from diversified habitats to demonstrate antagonism, commensalism and synergism
- Isolation of *Cyanobacteria* and fungi from different habitats
- Identification of fungi by staining techniques
- Microscopic observation of soil algae and Protozoa
- Winogradsky's column to demonstrate microbial diversity
- Visit and observe any nearby unique ecosystems to understand the role of microorganisms
- Demonstration of the great plate count anomaly

References:

1. Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
2. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
3. Burns, R.G. and Slater, J.H. (1982). Experimental Microbiology and Ecology. Blackwell Scientific Publications, USA.
4. Peppler, I.L. and Gerba, C.P. (2004). Environmental Microbiology – A Laboratory Manual.Academic Press. New York.
5. Gupte, S. (1995). Practical Microbiology. Jaypee Brothers Medical Publishers Pvt. Ltd.
6. Kannan, N. (2003). Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers.Panima Publishing Co., New Delhi.
7. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, 2nd edition.Himalaya Publishing House, Mumbai.
8. Reddy, S.M. and Reddy, S.R. (1998). Microbiology – Practical Manual, 3rd Edition, Sri Padmavathi Publications, Hyderabad

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SKILL ENHANCEMENT COURSE-I (SEC-I)

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Syllabus for B.Sc Microbiology **Code: BS, SEC-1**

B.Sc II year: III Semester

Title: HAEMATOLOGY **2HPW-Credits-2**

UNIT-1: INTRODUCTION TO BLOOD

Blood: definition, characters, composition. Collection of blood – capillary blood: from adults and infants, examinations employed. Venous blood: from adults and infants, examinations employed Composition of blood (RBC, WBC, Plasma, Serum, Platelet cells), Staining of blood films. Total blood picture, Differential count. Blood grouping, Rh-typing. Haemoglobin: composition and normal values, haemoglobin estimation Anti-coagulants.

UNIT-2: BLOOD TRANSFUSION

Principles of blood transfusion, Donor screening – cross matching, collection of blood, preservation and storage. Precautions of handling blood and it's products. Challenges in management of Hemophilia and Anaemia. General account on spread of diseases through blood and blood products. Coagulation mechanism: factors, bleeding time, clotting time. Haematological indices: packed cell volume. Erythrocyte sedimentation: principle – determination.

References:

1. Kawthalkar.Essentials of Haematology Paperback – 2013
2. Lokwani.D.P.The ABC of CBC Interpretation of Complete Blood Count and HistogramsPaperback – 2013
3. RamnikSood . Medical Laboratory technology Methods and Interpretation Jaypee Publications.
4. ShirishMKawthalkar. Essential Of Hematology. Jaypee Publications.

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Syllabus for B.Sc Microbiology **Code: BS, DSC-1C**

B.Sc II year: III Semester

Title: FOOD AND ENVIRONMENTAL MICROBIOLOGY **4 HPW-Credits-4**

UNIT 1: FERMENTED FOODS

Introduction to fermented foods; Health aspects of fermented foods; Fermented vegetables: Processing and fermentation of Sauerkraut and pickles, idly. Dairy Microbiology - Types of microorganisms in milk, significance of microorganisms in milk, Microbial products of milk-Bulgarian milk, Kefir, cheese, yogurt; Microorganisms as food; Probiotics and Prebiotics.

UNIT 2: MICROBIAL FOOD SPOILAGE AND POISONING

Microbial Spoilage of foods; Microbial Food poisoning, risks and hazards; Mycotoxins and their poisoning/toxicity; Food preservation methods and food safety issues. Food Quality: Importance and functions of quality control. Methods of quality assessment of foods; Screening and Enumeration of spoilage microorganisms, Detection of pathogens in food.

UNIT 3: AIR AND WATER MICROBIOLOGY

Microorganisms in air and their importance (brief account); Microorganisms and water pollution Water-borne pathogenic microorganisms and their transmission; Sanitary quality of water; Water pollution due to degradation of organic matter; Aerobic and Anaerobic sewage treatment,

UNIT 4: SOIL MICROBIOLOGY

Soil properties (physical, chemical and biological), Soil microorganisms, Methods of enumeration and activity of microbes in environment/soil; Microbes and plant interactions – Rhizosphere, Phyllosphere and Mycorrhizae; Introduction to Microbial Bioremediation, Microbial degradation of organic pollutants; Carbon and Nitrogen cycle.

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers.ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.

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5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
7. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA
8. Paul, E.A. and Clark, F.E. (1989). Soil Microbiology and Biochemistry, Academic Press, USA.

FOOD AND ENVIRONMENT MICROBIOLOGY

PRACTICALS

2HPW-Credits-1

- Determination of microbiological quality of milk by MBRT method.
- Isolation of fungi & bacteria from spoiled fruits/vegetables/Milk/Meat products.
- Isolation of microorganisms from air by impingement method.
- Microbiological examination of water by coliform test.
- Determination of biological oxygen demand.
- Extraction of Mycotoxins from contaminated grains/foods.
- Detection of Mycotoxins
- Isolation and identification of probiotic bacteria
- Isolation and identification of probiotic yeast

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers.ASM Press, Washington D.C., USA.
3. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, McGraw-Hill, New York.
4. Jay, J.M. (1996). Modern Food Microbiology, Chapman and Hall, New York.15
5. Ray, B. (1996). Fundamentals of Food Microbiology, CRC Press, USA.
6. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA

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SKILL ENHANCEMENT COURSE-III (SEC-3)

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Syllabus for B.Sc Microbiology **Code: BS, SEC-3**

B.Sc III year: IV Semester

Title: MUSHROOM CULTIVATION **2HPW-Credits-2**

UNIT-1

- Introduction to mushroom cultivation
- Importance and history of mushroom cultivation in India
- Global status of mushroom production
- Edible mushrooms (white button oyster, Paddy straw).
- Nutritional value and health benefits of mushrooms

UNIT-2

- Steps in mushroom cultivation
  a. Selection of site and types of mushroom
  b. Mushroom farm structure, design layout
  c. Principle and techniques of compost and composting
  d. Principle of spawn production
  e. Casing and crop production
  f. Harvesting and marketing
  g. Entrepreneurship development in Mushroom cultivation
- Pest and pathogens of mushrooms
- Post harvest handling and preservation of mushrooms

Reference:

1. Mushroom cultivation in india by B.C.Suman and V.P. Sharma Published by Daya publishing house New Delhi.
2. Mushrooms Cultivation, Marketing and Consumption Manjit Singh Bhuvnesh Vijay Shwet Kamal G.C. Wakchaure Directorate of Mushroom Research (Indian Council of Agricultural Research) Chambaghat, Solan –173213 (HP)

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Syllabus for B.Sc Microbiology **Code: BS, DSC-1D**

B.Sc II year: IV Semester

Title: MEDICAL MICROBIOLOGY & IMMUNOLOGY **4 HPW-Credits-4**

UNIT-1: MEDICAL BACTERIOLOGY

Histroy of Medical Microbiology. Normal flora of human body,
Host pathogen interactions.Bacterial toxins, virulence and attenuation.Antimicrobial resistance.
Air borne diseases -Tuberculosis.
Food and waterborne diseases- Cholera, Typhoid.
Contact diseases - Syphilis, Gonorrhea. General account of nosocomial infections.

UNIT-2: MEDICAL VIROLOGY AND PARASITOLOGY

Food and waterborne diseases - Poliomyelitis, Amoebiasis.
Insect borne diseases-Malaria, Dengue fever.
Zoonotic diseases – Rabies
Viral diseases- Hepatitis B, HIV, SARS, MERS; Air borne diseases- Influenza.

UNIT-3: INTRODUCTION TO IMMUNOLOGY

History of immunology. Cells and organs of immune system- Primary and Secondary lymphoid organs.Functions of B&T Lymphocytes, Natural killer cells, Polymorphonuclear cells.
Structure and classification of Antigens, Factors affecting antigenicity.
Antibodies-Basic structure,Types,properties and functions of immunoglobulins.
Types of immunity-Innate and Acquired; Humoral and cell mediated immune response.
Major Histocompatibility Complex- Class I and II

UNIT-4: IMMUNOLOGICAL DISORDERS AND AG-AB REACTIONS

Types of hypersensitivity - Immediate and delayed.
Systemic and localized autoimmune disorders
Complement pathways – Classical and Alternate.
Types of Antigen-Antibody reactions- Agglutination, blood groups, precipitation, neutralization, complement fixation test. Labeled antibody based techniques-ELISA, RIA and Immunofluorescence; Polyclonal and monoclonal antibodies production and application

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References:

1. Gottschalk, G. (1986). Bacterial Metabolism, Springer-Verlag, New-York.
2. Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications, Iowa, USA.
3. Moat, A.G. and Foster, J.W. (1995). Microbial Physiology, John-Wiley, New York.
4. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.
5. Reddy, S.R. and Reddy, S.M. (2004). Microbial Physiology, Scientific Publishers, Jodhpur, India.
6. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2nd Edition, CBS Publishers and Distributors, New Delhi.
7. Elliot, W.H. and Elliot, D.C. (2001). Biochemistry and Molecular Biology, 2nd Edition, Oxford University Press, U.S.A.

MEDICAL MICROBIOLOGY & IMMUNOLOGY

PRACTICALS

2HPW- Credits-1

- Determination of blood grouping and RH typing.
- Total count of RBC and WBC.
- Differential count of blood leucocytes.
- WIDAL test for typhoid(slide test)by Ag-Ab reactions
- VDRL test for syphilis (slide test) by Ag-Ab reactions.
- Ouchterlony double diffusion test
- Separation of serum and plasma
- IMViC test - Indole test, Methyl red test,VogesProskauer test, Citrate utilization test.
- Oxidase test.
- Catalase test.
- Antibiotic sensitivity testing – Disc diffusion method

References:

1. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, .Himalaya Publishing House, Mumbai.
2. Experiments in Microbiology by K.R. Aneja.

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Syllabus for B.Sc Microbiology **Code: BS, GE**

B.Sc III year: V semester

Title: MICROBIOLOGY AND HUMAN HEALTH **4 HPW-credits-4**

UNIT-1: INTRODUCTION

Historic developments of Microbiology, contributions of Van Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch.

Types of microorganisms, Morphological characteristics of bacteria, Staining, cultivation methods of bacteria, Culture Media used for the growth of microrganisms.

UNIT-2: MICROORGANISMS: GOOD AND BAD

Microorganisms related to human health. Normal microbial flora, Human microbiome concept.

Bacterial disease: Typhoid, Tuberculosis, Syphilis

Viral diseases: Flu, SARS, MERS, SARS-CoV-2, HIV

Insect borne: Malaria and Dengue

UNIT-3: IMMUNITY AND HEALTH

Introduction to immune system; Understanding the terms: Disease, Infection, Pathogenicity, Prophylaxis, Host resistance, Innate immunity and acquired immunity, Epidemics, Endemics and Pandemics; Importance of probiotics and vaccines for human health

UNIT-4: WASTE MANAGEMENT AND HEALTH HAZARDS

Health hazards associated with dumpage of Industrial and Biomedical waste.

National and international guidelines for the disposal of waste. Guidelines of Central Pollution Control Board (CPCB). Safe disposal and pretreatment of wastes. Mechanical and chemical treatment of the waste. Autoclaving, incineration.

References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harly, J.P. and Klein Microbiology 5th Edition, WCB McGrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube, R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.
5. Ananthanarayan and Panikar. Text book of Microbiology. Universities Press.

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Syllabus for B.Sc Microbiology **Code: BS, DSE-1A**

B.Sc III year: V Semester

Title: MOLECULAR BIOLOGY & MICROBIAL GENETICS **4HPW-credits-4**

UNIT-1: MICROBIAL GENETICS

Fundamentals of Genetics – Mendelian laws, Alleles, Crossing over and Linkage
DNA and RNA as genetic material
Structure of DNA – Watson and Crick model
Extra chromosomal genetic elements – Plasmids and Transposons
Replication of DNA- Semi conservative mechanism

UNIT-2: MUTATIONS AND GENETIC RECOMBINATION

Mutations – Spontaneous and induced, Base pair changes, Frameshift, Deletion, Inversion, Tandem duplication, Insertion
Various physical and chemical mutagens
Outline of DNA damage and repair mechanism
Brief account on gene transfer among bacteria – Transformation, Transduction and Conjugation

UNIT-3-GENE EXPRESSION

Concept of gene – Muton, Recon and Cistron
One gene – one enzyme , One gene – one Poly peptide , One gene – one product hypothesis
Types of RNA and their functions
Outline of RNA transcription in Prokaryotes
Genetic code, Structure of Ribosomes and brief account on protein synthesis
Type of genes – Structural, Constitutive, Regulatory
Operon concept.Regulation of gene expression in bacteria – Lac Operon.

UNIT-4-RECOMBINANT DNA TECHNOLOGY

Basic principles of genetic engineering –Restriction endonucleases,
DNA polymerases and Ligases, vectors
Outline of gene cloning methods.
Genomic and cDNA libraries
General account on application of genetic engineering in industry, agriculture and medicine.

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References:

1. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
2. Crueger, W. and Crueger, A. (2000). Biotechnology: A Text Book of Industrial Microbiology, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
4. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
5. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.
6. Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5th Edition. McGraw Hill, New York.
7. Glazer, A.N. and Nikaido, H. (1995). Microbial Biotechnology – Fundamentals of Applied Microbiology, W.H. Freeman and company, New York.
8. Old, R.W. and Primrose, S.B. (1994) Principles of Gene Manipulation, Blackwell Science Publication, New York.
9. Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.

MOLECULAR BIOLOGY & MICROBIAL GENETICS

PRACTICALS

2HPW- credits-1

- Colorimetric estimation of proteins by Biuret method.
- Colorimetric estimation of DNA by Diphenyl amine method.
- Colorimetric estimation of RNA by Orcinol method
- Extraction of genomic DNA
- Extraction of plasmid DNA
- Separation and observation of genomic DNA by Agarose gel Electrophoresis
- Separation and observation of plasmid DNA by Agarose gel Electrophoresis

References:

1. Experiments in Microbiology by K.R. Aneja.
2. GopalReddy.M., Reddy. M.N., SaiGopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.
5. Mahy, B.W.J. and Kangro, H.O. Virology – Methods Manual Academic Press, USA.

Burleson et al Virology – A Laboratory Manual.Academic Press, USA.

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Syllabus for B.Sc Microbiology **Code: BS, DSE-1B**

B.Sc III year: 5thsemester

Title: MICROBIAL OMICS **4 HPW-Credits-4**

UNIT 1: INTRODUCTION TO OMICS

Introduction to molecular biology. Structure of DNA, RNA. Multi omics approach for analysis of Microbial biology: Genomics, Transcriptomics (RNA-Seq), Proteomics, Metabolomics, Metagenomics and their applications; Basic Concepts in high throughput sequencing or Next-Generation Sequencing methods for use in food-microbiology, diagnostics and Human health.

UNIT 2: PROTEOMICS

Protein structure – Different levels of protein structure, Protein Folding and unfolding. Protein secondary and 3D structure prediction methods. X-ray crystallography, NMR and homology modeling. Protein micro arrays- Protein Markers, Clinical Proteomics, Protein engineering, Proteomic strategies in Cancer, Prions.

UNIT 3: GENOMICS

An introduction of functional genomics; Site-directed mutagenesis, Transposon mutagenesis, DNA microarray, RNA interference, and Chromatin immune precipitation.
Genome annotation, Applications of functional genomics in vaccine and drug designing, Genome editing tools such as CRISPR/Cas9. Databases of Microbial Genomics; Microbial genome projects

UNIT 4: BIOINFORMATICS

Introduction to Bioinformatics and Molecular Databases, Primary Databanks – NCBI, EMBL, DDBJ; Secondary Databases – UNIPROT; Structural Database –PDB; Database similarity search (FASTA, BLAST); Alignment: Pairwise and Multiple sequence alignment; Whole genome sequence; Genome Annotation and Gene Prediction; Primer Designing; Phylogenetic analysis and Tree construction.

References

1. Principles of Protein structure, Schultz, G. E., and Schirmer, R. H. Dr. ShaktiSahi
2. Proteomics, Daniel C. Leibler
3. Microbial Proteomic, MarjoPoutanen
4. Proteins: Structures and Molecular Principles (2d ed.), TE Creighton
5. Organic spectroscopy, William Kemp
6. Proteome Research: Two-Dimensional Gel Electrophoresis and DetectionMethods (Principles andPractice), T. Rabilloud (Editor), 2000, Springer Verlag

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7. Introduction to Protein Architecture: The Structural Biology of Proteins, M.Lesk, 2001, Oxford University Press.
8. Molecular Biotechnology by Bernard R. Glick and Jack J Pasternak
9. DNA Microarrays Ed. M. Schena.

MICROBIAL OMICS

PRACTICALS

2HPW-credits-1

1. Protein isolation from *E coli.*
2. Sequence analysis of proteins (by BLAST, ClustalW and Phylip).
3. Protein structure prediction by Homology modeling.
4. Isolation of Genomic DNA from *E.coli* and its demonstration by OD and agarose electrophoresis
5. Isolation of plasmid DNA from *E.coli* and its demonstration by OD and agarose electrophoresis
6. DNA molecular size determination
7. Primer designing using online software
8. PCR amplification of genes and detection of amplicon by agarose gel electrophoresis

References:

1. Molecular biotechnology by Chanarayppa

2. Methods in Molecular Cloning by Sambrook.

3. Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). Laboratory Experiments in Microbiology, 2nd edition.Himalaya Publishing House, Mumbai.

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With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: DSE-2A**

B.Sc III year: VI Semester

Title: INDUSTRIAL MICROBIOLOGY **4 HPW-Credits-4**

UNIT-1: MICROORGANISMS AND SELECTION

Introduction to Industrial Microbiology, Microorganisms of industrial importance -Yeast, Molds, Bacteria, Actinomycetes. Screening and selection of industrially useful microbes. Steps to maintain seed culture and inoculation strategies for enhanced product yield. Strain improvement strategies. Immobilization methods – adsorption and entrapment.

UNIT-2: FERMENTATION

Design of bioreactor. Physico-chemical standards used in bioreactors. Limitations of bioreactor, Fermentation equipment and its use. Design of fermentor, type of fermenter, agitation, aeration, antifoam, pH and temperature control. Stages of fermentation process. Inoculation media and fermentation media ; Raw materials used in fermentation industry and their processing, Downstream processing.

Unit-3: TYPES OF FERMENTATON

Types of fermentations: Batch, Fed batch, continuous types and kinetics. Submerged, surface, solid state, dual and multiple fermentations. Advantages and disadvantages of solid substrate and liquid fermentations. Fermentation. Common Microbial fermentation, alcohol and lactic acid fermentation.

UNIT-4: MICROBIAL PRODUCTS

Industrial products derived from microbes: vitamins: B12; Vaccines: recombinant vaccines, production of beverages (beer and wine), biofuels (biogas and methane), enzymes (amylase), antibiotics (penicillin), aminoacids (glutamic acid), organic acid (citric acid). Disposal of industrial waste.

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology – A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology.Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA

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INDUSTRIAL MICROBIOLOGY

PRACTICALS

2HPW-Credits-1

1. Screening for amylase producing microorganisms
2. Screening for organic acid producing microorganisms
3. Estimation of Ethanol by potassium dichromate method.
4. Production of citric acid by submerged fermentation
5. Estimation of Citric acid by titrimetry method.
6. Estimation of penicillin.
7. Bacterial slides- Bacillus, Lactobacillus, Yeast, Aspergillus, Pencillium

References:

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology – A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and SingaraCharya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology.Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA.

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Syllabus for B.Sc Microbiology **Code: DSE-2B**

B.Sc III year: VI Semester

Title: PHARMACEUTICAL MICROBIOLOGY **4 HPW-Credits-1**

Unit-1: INTRODUCTION TO CHEMOTHERAPY

History of chemotherapy – plants and arsenicals as therapeutics, Paul Ehrlich and his contributions, selective toxicity and target sites of drug action in microbes. Development of synthetic drugs – Sulphanamides, antitubercular compounds, nitrofurons, nalidixic acid, metronidazole group of drugs.

Unit-2: ANTIBIOTICS

The origin, development and definition of antibiotics as drugs, types of antibiotics and their classification. Non-medical uses of antibiotics.Principles of chemotherapy – Clinical and lab diagnosis, sensitivity testing, choice of drug, dosage, route of administration, combined/mixed multi drug therapy, control of antibiotic/drug usage.

Unit-3: DRUG RESISTANCE

The phenomenon of drug resistance, clinical basis of drug resistance, biochemistry of drug resistance, genetics of drug resistance in bacteria.

Mode of action of important drugs – Cell wall inhibitors (Betalactam – eg. Penicillin), membrane inhibitors (polymyxins), macromolecular synthesis inhibitors (streptomycin), antifungal antibiotics (nystatin)

Unit-4: MICROBIOLOGICAL ASSAYS

Assays for growth promoting substances, nutritional mutants and their importance. Drug sensitivity testing methods and their importance. Assay for antibiotics – Determination of MIC, the liquid tube assay, solid agar tube assay, agar plate assay (disc diffusion, agar well and cylinders cup method).

References:

1. Ananthanarayana, R. and Panicker, C.K.S. (2000). Text Book of Microbiology, 6th Edition, Oriental Longman Publications, USA.
2. Gupte, S. (1995). Short Text Book of Medical Microbiology, 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
3. Biochemistry of antimicrobial action. Franklin,DJ. and Snow, GA.Pub:Chapman& Hall. Antibiotics and Chemotherapy.Garrod, L.P., Lambert, HP. And O'Grady, F. (eds). Publ: Churchill Livingstone.

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4. Antibiotics. Lancini, G. and Parenti, F. publ: Springer-Verlag.
The Molecular Basis of antibiotic action. Ga.e, EF.Et al.Publ: Wiley, New York.
Antimicrobial Drug action.Williams, RAD., Lambart, PA.& Singleton, P. Pub:Bios Sci.
Microbiological Assays.Hewitt.

PHARMACEUTICAL MICROBIOLOGY (CBCS)

PRACTICALS

2 HPW- Credits-1

1. Tests for disinfectants (Phenol coefficient/RWC)
2. Determination of antibacterial spectrum of drugs/antibiotics
3. Chemical assays for antimicrobial drugs
4. Testing for antibiotic/drug sensitivity/resistance
5. Determination of MIC for antimicrobial compounds
6. Microbiological assays for antibiotics (Liquid tube assay, agar tube assay, agar plate assays)

Reference/Recommended Books for MB Pharmaceutical Microbiology

1. Disinfection, sterilization and preservation. Block, S.S. (ed). Lea and Febigor, Baltimore
2. Pharmaceutical Microbiology. Huge, W.B. and Russel, AD.Blackwell Scientific, Oxford
3. Inhibition and destruction of microbial cell by Hugo, WB. (ed). Pub: Academic Press,NY
4. Manual of Clinical Microbiology. Lennette, EH. (ed).Pub: American Society for Microbiology, Washington.
5. Principles and Practices of disinfection. Russell, AP.,Hugo,WB., and Ayliffe, GAJ.(eds). Publ. Blackwell Sci.
6. Biochemistry of antimicrobial action. Franklin,DJ. and Snow, GA.Pub:Chapman& Hall.
7. Antibiotics and Chemotherapy. Garrod, L.P., Lambert, HP. And C'Grady, F. (eds). Publ: Churchill Livingstone.
8. The Molecular Basis of antibiotic action. Ga.e, EF. Et al. Publ: Wiley, New York.
9. Antimicrobial Drug action. Williams, RAD., Lambart, PA. & Singleton, P. Pub:Bios Sci.

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Elective Against Project
Dept. Microbiology: Osmania University
Proposed scheme for B.ScMicrobiology program under choice based credit system (CBCS)

With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS**

B.Sc III year: VI Semester

Title: APPLIED MICROBIOLOGY **3 HPW-Credits-3**

UNIT-1: MICROBIAL PRODUCTS FOR SMALL SCALE ENTREPRENEURS

Maintenance of type strains or reference strain of microorganisms: culture collection centres (MTCC, ATCC). Patenting process and IPR. Microorganisms in agriculture. Nitrogen fixation and phosphate solubilization. Biofertilizers- Production of azolla, rhizobium and mycorrhizae. Biofungicides- Mass production of Trichoderma and Pseudomonas. Biopesticides- Bacterial, fungal and viral.

UNIT-2: METABOLIC ENGINEERING FOR MICROBIAL PRODUCTS

Production of microbial pigments (prodigiosin, violacein, monascin). Bacterial and algal carotenoids. Microrganisms for flavor and aroma production. Biotransformation and metabolic engineering of microorganisms to produce compounds such as esters, terpenes, aldehydes, lactones, geosmin, vanillin and coumarin.

UNIT-3: MICROBIAL DIAGNOSTICS AND HEALTH

Diagnostic microbiology: collection, transport and culturing of clinical samples. Preparation and use of culture media for detection of microbial pathogens. Examination of sample by staining - Gram stain, Ziehl-Neelsen staining for tuberculosis, Blood smear for malarial parasite. Serological methods for rapid detection of bacterial, fungal and viral pathogens.
Techniques used for the diagnosis of hospital acquired infections and multi drug resistant microorganisms. Monitoring of sanitation in community –Biohazard disposal.

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
3. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA.
4. Ananthanarayan R and Paniker CKJ (2009). Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
5. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)

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Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
6. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.

APPLIED MICROBIOLOGY

PRACTICALS

2 HPW-Credits-1

1. Isolation and enumeration of Rhizosphere microorganisms.
2. Isolation of Rhizobium from leguminous root nodules.
3. Staining & observation of mycorrhizal fungi.
4. Mass production of Rhizobium , Mycrorhizae, Trichoderma and Pseudomonas using different carriers / substrates and methods to assay quality control of bioproducts
5. Grams staining
6. Ziehl-Nielsen staining
7. Blood smear

References:

1. Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
2. Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
3. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications, Addison Wesley Longman, Inc., USA

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Project

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With effect from 2020-21

Syllabus for B.Sc Microbiology **Code: BS**

B.Sc III year: 6th semester

Title: PROJECT **5 HPW-Credits-4**

1. Number of students who will be offered project work will vary batch to batch depending upon the infrastructural facilities and may vary each year (Not exceeding 5 students per group).
2. Project work will involve experimental work and the student will have to complete this in stipulated time.
3. The final evaluation of the project work will be through a Panel involving internal and external examiners.
4. Students will be asked their choice for Project work at the beginning of VI semester and all formalities of topic and mentor selection will be completed.

Project work will be offered in lieu of expertise and infrastructural facilities of the department and will be evaluated for 4 credits.

5. The distribution of marks for project work will be:

Project work: 100 Marks (50 marks for dissertation + 25 marks for research skills + 25 marks for research work presentation).

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