



પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-2020 અંતર્ગત સ્કીલ એન્હાન્સમેન્ટ કોર્સનો સેમેસ્ટર-૪નો અભ્યાસક્રમ આ સાથે સામેલ છે. આ બાસ્કેટમાં સાયન્સનાં વિષયો આપવામાં આવેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૪ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો દ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

નોંધ: તા.૨૩/૦૧/૨૦૨૫નાં પરિપત્ર નં: ૩૧૪/ ૨૦૨૫માં ૧. Plant Breeding ૨. Advanced GeoGebra (FOSS)નાં અભ્યાસક્રમમાં ફેરફાર કરવામાં આવેલ છે અન્ય અભ્યાસક્રમમાં કોઈ ફેરફાર કરવામાં આવેલ નથી.



18/6/2025

ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/એકેડેમિક/૨૮૨/૨૦૨૫

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૧૮.૦૬.૨૦૨૫

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઈ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



BHAKTA KAVI NARSINH MEHTA UNIVERSITY
JUNAGADH



BOARD OF STUDIES
FACULTY OF SCIENCE
BASKET FOR SKILL ENHANCEMENT COURSE
(SEMESTER- IV)

EFFECTIVE FROM JUNE, 2024

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Skill Enhancement Course (SEC)
Syllabus for Faculty of Science as per NEP
Effective from June 2024
SEMESTER-4

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Course Level	5.0	Internal Marks	12
Programme	B.Sc (Honours)	External Marks	25
Semester	4	Practical Internal	13
Course Type	Skill Enhancement Course-4	Practical External	-
Course Credit	02	Prac. Ext. Exam Time	-
Teaching Hours	Theory-15 Practical-30	Total	50
Course Code		Exam Duration	1 Hour
Course Title	Operating System		

Course Objectives: On successful completion of the course, the students will be able to:

1. To disseminate the information about basic operating system objectives, functions and features
2. To impart the know-how of process management and memory management
3. To teach the basics of how to write simple programs to be run on unix/linux OS

Course Learning Outcomes: On successful completion of the course, the students will be able to:

1. Enhance the understanding of OS concepts
2. Developing know how of manipulating files and directories on disc
3. Having knowledge of developing program applications on Unix/Linux

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
3	1	• Operating System: ○ Definition and concept ○ Functions and objectives of OS ○ Types of OS • Process Management: ○ Definition and concept ○ Process and State Transition Diagram ○ Process Scheduling algorithm (FCFS, SJN, Round Robin, Priority based Scheduling) ○ Interposes communication and synchronization. • Memory Management: ○ Memory allocation concept ○ Memory allocation Strategies (Paging, segmentation)	05

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		○ Physical and Virtual Memory	
	2	● Programming with Unix/Linux operating system: ○ Introduction ▪ History, evolution and features of Unix and Linux ▪ Comparison with other operating systems ○ File System ▪ File system hierarchy ▪ File & Directory Permissions ▪ Login commands (passwd, logout, who, who am i, clear) ▪ Basic file operations (create, delete, copy, move) ▪ File and directory commands (ls, echo, cat, cd, pwd, mv, cp, rm, rmdir, mkdir, umask, chmod, chown, chgrp, find, pg, more, less, head, tail, wc, touch) ○ Basics of Shell programming ▪ Shell Keywords, Variables (Shell, User, System) and operators ▪ Creating interactive shell script ▪ Decision Statements (if then fi, if then else fi, if then elif else fi, case esac) ○ Looping Statements (for loop, while loop, until loop, break, continue)	10
	3	Practical	30

Suggested Reading:

1. Operating System by William Stallings.
2. Unix Shell Programming by Y. Kanetkar.

Website References:

1. <https://www.geeksforgeeks.org/operating-systems/>
2. https://www.tutorialspoint.com/operating_system/index.htm
3. <https://www.geeksforgeeks.org/essential-linuxunix-commands/>
4. https://www.tutorialspoint.com/unix/shell_scripting.html

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03

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4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam.

Paper Style

Ques. No.	Particulars	From which Unit	Marks
1	Questions (Any Two Out Of Four)	1	10
2	Questions (Any Two Out Of Four)	2	10
3	Questions (Any One Out Of Two)	From Each Unit	05
		Total Marks	25

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Course Level	5.0		Internal Marks	25
Programme	B.Sc (Honours)		External Marks	25
Semester	4		Practical Internal	-
Course Type	Skill Enhancement Course-4		Practical External	-
Course Credit	02		Prac. Ext. Exam Time	-
Teaching Hours	30		Total	50
Course Code			Exam Duration	1 Hour
Course Title	HOME NURSING AND FIRST AID			

Course Objectives: The students will be able to understand about the home nursing.

Course Learning Outcomes: To get the alimentary knowledge about first aid treatment needed in Various injuries.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
3	1	HOME NURSING - The nurse and her duties. - The sickroom-choice, ventilation, heating, lighting and cleaning. - Bed and bedding-choice and care - Lecture/ demonstration on care and comfort of the patient, including: Bed-making and changing bottom sheets.	15
	2	FIRST AID - Introduction and definition - Principles of First aid - First aid during cuts - First aid during burns - First aid during fractures - First aid during poisons and bites (snake) 7. First aid during insect bites	15

Suggested Reading:

- Community nursing in developing countries by Monica Byrne & F. J. barnety
- Text book of First Aid - Published by John Ambulance Association.
- (ApattiVyavasthapan) Disaster Management by S. N. Parikh, Dr. G. P. Mankad. Dr. K. G. Vyas

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INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam

Paper Style

Ques. No.	Particulars	From which Unit	Marks
1	Questions (Any Two Out Of Four)	1	10
2	Questions (Any Two Out Of Four)	2	10
3	Questions (Any One Out Of Two)	From Each Unit	05
		Total Marks	25

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Course Level	5.0	Internal Marks	25
Programme	B.Sc (Honours)	External Marks	25
Semester	4	Practical Internal	-
Course Type	Skill Enhancement Course-4	Practical External	-
Course Credit	02	Prac. Ext. Exam Time	-
Teaching Hours	30	Total	50
Course Code		Exam Duration	1 Hour
Course Title	PLANT BREEDING		

Course Objectives: On completion of the course, the students will be able to:

- Understand the fundamental concepts of pharmacognosy.
- Develop the skills of alkaloids extraction.
- Examine the alkaloids.
- Evaluate the process of screening alkaloids.

Pedagogy: Lectures/ Use of Multimedia / Assignments/ Hands-on experiments/ Demonstrations/ Field visit.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
3	1	Plant Breeding: • Introduction, definition and objectives of plant breeding. • Breeding systems: modes of reproduction in crop plants. • Important achievements and undesirable consequences of plant breeding. • Vegetatively propagated plants – Procedure, advantages and limitations.	15
	2	Inbreeding depression and heterosis: • History, genetic basis of inbreeding depression and heterosis; Applications. • Selection methods: Mass selection and Pure line	15

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		selection. - Hybridization procedure - Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	
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Suggested Reading:

1. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
2. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.
3. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam.

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SEMESTER-4

Paper Style

Ques. No.	Particulars	From which Unit	Marks
1 (A)	Describe in detail (Any One) (1) (2)	1	06
1 (B)	Write a Short Note (Any One) (1) (2)		04
2 (A)	Describe in detail (Any One) (1) (2)	2	06
2 (B)	Write a Short Note (Any One) (1) (2)		04
3	Do as Directed (Any Five from Seven) (1) (2) (3) (4) (5) (6) (7)	From 1 & 2	05
Total		25	

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Course Level	5.0	Internal Marks (Practical)	25
Programme	B.Sc (Honours)	External Marks (Theory)	25
Category of Course	Skill Enhancement Course-4	Practical Exam Duration	2 Hrs
Course Credit	2	Theory Exam Duration	1 hrs
Teaching Hours	15T +30P = 45	Total	50
Course Code			
Course Title	Chromatographic Techniques		

Course Objectives:

- To develop the skill of analysing components of various types of mixtures containing amino acids, metal ions, phenols, sugar molecules etc using simple chromatographic techniques.

Course Learning Outcomes: After completion of the course:

- Learners will develop theoretical background and practical skill of using chromatography as a technique in identifying and separating various components from different types of mixtures.
- They will be able to identify the system, type and method most suitable for identification and separation of mixtures. like amino acids, metal ions, phenols, sugar molecules etc.

Sem	Unit No.	Syllabi	Teaching Hours
3	1	Chromatography Introduction, Classification of chromatography - types of chromatography, Principle of Chromatography Column chromatography: Principle, Adsorbents, Preparation of column, Method, Separation of green leaf pigment, Paper chromatography: Introduction, Principle, Types of Paper Chromatography (Ascending and Descending, Two dimensional; Circular), Migration parameters (R_f value and R_x value), Spotting and Visualization. Separation of amino acids and metal ions (Fe^{+} , Co^{+2} , Ni^{+2}) mixture using spray reagent ninhydrine and aniline phthalate TLC: Introduction, Principle, Method of preparation of chromplate, Experimental techniques, Superiority of TCL over other chromatographic Techniques, Application of TLC.	7T

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	2	Gas chromatography; Introduction, Types, Principle of GLC and GSC, Instrumentation, Carrier gas and Solvent, Column and Detectors (Briefly), Advantages of gas chromatography Ion Exchange chromatography: Introduction, Definition and Principle, Type of resins, Properties of ion exchange resins, Factors affecting separation of ions, Ion exchange capacity, Applications (Removal of interfering ion, Softening of water, Demineralization of water, Separation of lanthanides)	8T

Practical

Sem	Syllabi	Teaching Hours
3	Chromatography Atleast six practicals may be given. 1. To determine R_f value of individual amino acids in a mixture of amino acid by ascending paper chromatography. 2. To determine R_f value of individual and mixture of amino acid by circular paper chromatography. 3. To determine R_f value of individual and mixture of amino acid by thin layer chromatography (TLC). 4. To determine R_f value of individual and mixture of metal ions by ascending paper chromatography. 5. To determine R_f value of individual and mixture of metal ions by circular paper chromatography. 6. To determine R_f value of individual and mixture of two sugars by ascending paper chromatography. 7. Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC) 8. Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the R_f values.	30P

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Suggested Reading:

1. Principles of Inorganic chemistry – Puri, Sharma & Kalia
2. Concise Inorganic Chemistry - J. D. Lee
3. Advanced Inorganic Chemistry- Cotton and Wilkinson
4. Basic Inorganic Chemistry - Gurdeep & Chatwal
5. Organic Chemistry (Volume I, II & III) by S.M. Mukherji, S.P. Singh and R.P. Kapoor
6. Engineering Chemistry by Jain and Jain
7. Industrial Chemistry by B.K. Sharma
8. Handbook of practical chemistry by shubhash and satish
9. Thin Layer Chromatography by Egal Stall
10. Chromatographic separation by Tata McGraw Hill
11. A Textbook of Quantitative Inorganic Analysis by A. I. Vogel
12. Inorganic qualitative analysis by Vogel and Gehani Parekh
13. Reigel's Handbook of Industrial Chemistry by James A. Kent
14. Fundamental of Analytical Chemistry by Skoog and West
15. Instrumental Methods of Chemical Analysis by B. K. Sharma
16. Instrumental Method of Chemical Analysis by Chatwal Anand
17. Analytical Chemistry by Dick
18. Electrometric Methods of Analysis by Browning
19. Principle of Instrumental Methods of Analysis by Skoog.
20. Mikes, O. & Chalmes, R.A. Laboratory Hand Book of Chromatographic & Allied Methods, Elles Harwood Ltd. London.
21. Ditts, R.V. Analytical Chemistry – Methods of separation.
22. Jack T. Ballinger; Gersshon J. Shugar. Chemical Technicians' Ready Reference Hand bok, 5th Edition, 2011, ISBN:9780071745925, The McGraw-Hill com, Incpanies

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INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam

Paper Style

Ques. No.	Particulars	From which Unit	Marks
1	Any two out of 3 questions (5 marks each)	1	10
2	Any two out of 3 questions (5 marks each)	2	10
3	Any one out of 2 questions (5 marks each)	One Question from Each Unit	05
	Total Marks		25

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Course Level	5.0	Internal Marks	-
Programme	B.Sc (Honours)	External Marks	25
Semester	4	Practical Internal	-
Category of Course	Skill Enhancement Course-4	Practical External	-
Course Credit	01	Prac. External Exam Duration	-
Teaching Hours	30	Total	25
Course Code		Exam Duration	1 Hrs.
Course Title	Microbial Products: Bio-fertilizer & Bio-pesticides (Theory)		

Course Objectives: By completing the course, students have to:

- To expand the knowledge about the microbial role in agriculture field.
- To understand the importance of microorganism in production of biopesticides/bioinsecticides.

Course Learning Outcomes: After completion of the course:

- Have developed a very good understanding of practical aspects of production of biofertilizers.
- Have developed a very good understanding of practical aspects of the production of biopesticides/bioinsecticides.

Course Content

Sem	Unit No.	Syllabus	Teaching Hours
3	1	Symbiotic Nitrogen Fixers as Biofertilizers • General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. • Symbiotic N₂ fixers: <i>Rhizobium</i> - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants. <i>Frankia</i> - Isolation, characteristics, Alder, Casurina plants, non-leguminous crop symbiosis.	8
	2	Non - Symbiotic Nitrogen Fixers as Biofertilizers • Cyanobacteria as bio-fertilizers- Isolation, characterization, mass multiplication, Role in rice cultivation, Crop response, field application. Non - Symbiotic Nitrogen Fixers. Free living	8

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		<i>Azospirillum, Azotobacter</i> - free isolation, characteristics, mass inoculums, production and field application	
	3	Solubilizers and Biofertilizers Phosphate Solubilizers: Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application. Mycorrhizal Bio-fertilizers: Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM field applications.	7
	4	Bioinsecticides Bioinsecticides: General account of microbes used as bioinsecticides and their advantages over synthetic pesticides, <i>Bacillus thuringiensis</i>, production, Field applications, Viruses – cultivation and field applications.	7

Suggested Reading:

1. Eldor A. Paul. Soil Microbiology. Ecology and Biochemistry. VI Edition: Academic Press, (2007).
2. Eugene L. Madsen. Environmental Microbiology: From Genomes to Biogeochemistry. I Edition, Wiley-Blackwell Publishing (2008).
3. Agrios, G.N. Plant pathology. Harcourt Asia Pvt. Ltd. (2000).
4. Buchanan. B.B., Gruissem, W. and Jones, R.L Biochemistry and Molecular Biology of Plants. I.K. International Pvt. Ltd. (2000).
5. Mehrotra R S and Ashok Agrawal. Plant Pathology. Tata Mc Graw Hill ,6th reprint (2006).
6. K. S. Bilgrami, H. C. Dube. A textbook of modern pathology. 6th Edition, Vani Educational Books, a division of Vikas, (1984).
7. Shalini Suri. Biofertilizer and Biopesticide Aph Publishing Corporation (2011).

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Course Level	5.0	Internal Marks	25
Programme	B.Sc. (Honours)	External Marks	-
Semester	4	Practical Internal	-
Category of Course	Skill Enhancement Course-4	Practical External	-
Course Credit	01	Prac. External Exam Duration	1 Hrs.
Teaching Hours	30	Total	25
Course Code		Exam Duration	-
Course Title	Microbial Products: Bio-fertilizer & Bio-pesticides (Practical)		

Course Objectives:

1. To expand the practical knowledge about the microbial bioproducts.
2. To understand the importance of microorganism in production of biopesticides/bioinsecticides.

Course Learning Outcomes: After completion of the course:

1. Have developed a good practical understanding about the biofertilizer as valuable agricultural product.
2. Have developed a good understanding about the effect of biofertilizer and biopesticide.

Suggested Practical

Sr. No	Practical content	Teaching Hrs
1.	Isolation of symbiotic nitrogen fixer from the legume plant root.	30
2.	Isolation of non-symbiotic nitrogen fixer from the plant.	
3.	To microscopic observation of soil cyanobacteria.	
4.	To microscopic observation of Mycorrhiza.	
5.	Isolation of Phosphate Solubilizers from agricultural soil.	
6.	Isolation and examination of biopesticide producers.	
7.	Control and prevention of plant pathogen using biopesticides.	

Suggested reading

1. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-I, Aditya Publications, Ahmedabad, India.
2. Patel. R.J., Patel. K.R., Experimental Microbiology, Vol-II, Aditya Publications, Ahmedabad, India.

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3. Dubey. R.C., Maheshwari. D.K., Practical Microbiology, S.Chand & Company Ltd., New Delhi

INTERNAL EVALUATION SCHEME		
INTERNAL ASSESSMENT		
No.	Particulars	Weightage
1	Internal test (Theory or practical)	13
2	Assignment/practical assignment	5
3	Field visit report/ class presentation	5
4	Attendance	2
	Total	25

Paper Style:

Ques. No.	Particulars	From which Unit	Marks
Que.1	Question 1 (1) (2)	1 & 2	05 05
	Or		
	Question 1 (1) (2)		05 05
Que.2	Question 2 (1) (2)	3 & 4	05 05
	Or		
	Question 2 (1) (2)		05 05
Que.3	Question 1	From Any Unit	05
	Or		
	Question 2		
Total			25

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Course Level	5.0		Internal Marks	-
Programme	B.Sc (Honours)		External Marks	-
Semester	4		Practical Internal	25
Category of Course	Skill Enhancement Course-4		Practical External	25
Course Credit	02		Prac. External Exam Duration	2 HOURS
Teaching Hours	30		Total	50
Course Code			Exam Duration	2 HOURS
Course Title	Basics of Printed Circuit Board (PCB) and Breadboard			

Course Objectives:

- The course aims to provide hands-on experience in soldering techniques, constructing and testing simple electronic circuits using PCBs and breadboards.
- It covers practical skills in handling resistors, capacitors, diodes, and transistors, ensuring students understand the fundamentals of creating reliable electrical connections.
- Through various practical, students will gain confidence in circuit assembly, component placement, and troubleshooting, laying a solid foundation for advanced electronic design and prototyping.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Demonstrate proficiency in soldering various electronic components.
- Implement simple electronic circuits using resistors, capacitors, diodes, and, transistors on a PCB.
- Understand breadboard layout and effectively connect and disconnect components.
- Build simple electronic circuits using resistors, capacitors, diodes, and, transistors on a breadboard.
- Understand the differences between PCB and breadboard circuit implementations.

Course Contents:

Unit No.	Syllabi	Teaching Hours
List of Experiments	Practical 1: Practice soldering of various electronic components. Practical 2: Solder the joint connection of wires and components on a PCB and check it. Practical 3: Use of PCB to implement simple electronic circuits using resistors.	60

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	Practical 4: Use of PCB to implement simple electronic circuits using capacitors. Practical 5: Use of PCB to implement simple electronic circuits using diode or transistors. Practical 6: Introduction to breadboard layout and demonstrate how to connect and disconnect components and wires. Practical 7: Use of breadboards to implement simple electronic circuits using resistors. Practical 8: Use of breadboards to implement simple electronic circuits using capacitors. Practical 9: Use of breadboards to implement simple electronic circuits using diodes or transistors. Practical 10: Prepare any simple electronic circuits using general purpose PCB. Practical 11: Prepare any simple electronic circuits using Breadboard.	
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Suggested Reading:

Text Books:

1. Electronic Component and Materials by S.M.Dhir, Publisher: Tata McGraw Hills
2. Printed circuit boards design and technology by W.C. Bosshart Publisher: Tata McGraw Hills

Reference Books:

1. Electronics Project for Beginners, by A.K.Maini, Publishers: Pustak Mahal
2. Electrical Drawing by J.B.Gupta

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03

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10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam.

Paper Style

Sr. No.	Particulars	Marks
1	Understanding of Practical	15
2	Reading	10
	Total Marks	25

Course Level	5.0	Internal Marks	25
Semester	4	External Marks	25
Category of Course	Skill Enhancement Course-04	Practical Internal	-
Course Credit	02	Practical External	-
Teaching Hours	4 Hrs./ Week	Total	50
Course Code		Exam Duration	2 hrs.
Course Title	Communication skill		

Sr No.	Syllabus	Teaching Hours/ Week
1	Importance and process of Communication Verbal and Non-verbal process of Communication	4
2	How to face an interview Group Discussion, How to plan and conduct the Interviewer, importance of body language and gesture in interview, eye contact and appearance during interview process.	
3	Different skills and its importance Listening Skill, Developing Reading Skills, Developing Conversational skills, Technical Writing skills.	

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03

4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam.

External Exam**Total Marks: 25**

Sr. No.	Questions	Marks
1	Answer any one in detail. (Any One)	10
2	Answer any one in detail. (Any One)	10
3	Answer any one in detail. (Any One)	05

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Course Level	5.0		Internal Marks	25
Programme	B.Sc (Honours)		External Marks	25
Semester	4		Practical Internal	-
Course Type	Skill Enhancement Course-4		Practical External	-
Course Credit	02		Prac. Ext. Exam Time	-
Teaching Hours	30		Total	50
Course Code			Exam Duration	1 Hour
Course Title	Economic Zoology			

Course Objectives: On successful completion of the course, the students will be able to:

- The course is designed with an aim to provide knowledge of fishery biology including aquaculture, culture practices, induced breeding, various fish diseases, and fish by product, and post harvesting techniques.
- The course will create a deep understanding of major animal husbandry techniques like Apiculture, pearl culture and sericulture which helps in entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises.

Course Learning Outcomes: On successful completion of the course, the students will be able to:

Upon completion of the course, students should be able to:

- Learn major techniques and practices of aquaculture of Saurashtra coast.
- Learn about the importance of Animal husbandry with the help of study Apiculture, pearl culture and sericulture. Acquire sound knowledge on different components of apiculture, pearl culture and sericulture industry, Gain skill with hands on training on cultivation and carry forward to field, which helps in entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
3	1	FISHERIES BIOLOGY 1.1 Basics of aquaculture, definition and scope. History of aquaculture: Present global and national scenario. 1.2 Culture practices: Indian major carps and exotic carps; Shrimps and prawns. 1.3 Induced Breeding: Hormonal regulation of gonadal development, Activity of Gonadotropin releasing	15

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		hormone, application of hormones in aquaculture. 1.4 Nutrition in fish: Nutrition, Feed formulation, Feed additives, Alternative feed ingredients. 1.5 Fish Diseases (Dropsy, Fungus infection, Gill rot, White spot, Costiasis, Argulus disease) 1.6 Fish by products ○ Post harvesting Techniques in fisheries	
	2	ANIMAL HUSBANDRY 2.1 Apiculture: History, Classification and Life Cycle of Honey Bees; Social Organization of Bee Colony; Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth; Methods of Extraction of Honey (Indigenous and Modern); Products of Apiculture Industry and its Uses – Honey, Bees Wax, Propolis, Pollen etc. 2.2 Pearl culture: Important Pearl-Producing Oysters; Distribution in Indian Waters; Biology of Pearl Oyster; Formation of Pearl; Artificial Pearl Culture; Large-Scale Pearl Culture ○ Sericulture: Definition, history and present status; Silk route, Types of silkworms, Mulberry and non-mulberry Sericulture; Life cycle of <i>Bombyx mori</i>; Silkworm rearing technology: Early age and Late age rearing, Types of mountages, Spinning, harvesting and storage of cocoons.	15

Suggested Reading:

1. Fish & Fisheries of India ---V.G.Jhingram
2. Aquaculture – Principles and Practices --- Pillay, T.,V., R., Kutty, M., N. 2nd Edn. Blackwell Publishing, New Delhi.
3. Fishes an introduction to Ichthyology ---Paper and Moyle
4. Marine fisheries ---D.V.Bal, K.V.Rao
5. Ichthyology ---S.Chand
6. Text book of applied entomology –Srivastava
7. Economic zoology --Shukla &Upadhyaya
8. Pest management & Pesticides Indian scenario --Nyar B.V.

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INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03
22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam

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Paper Style:

Ques. No.	Particulars	From which Unit	Marks
Que.1	Question 1 (1) (2)	1	05
	Or		05
	Question 1 (1) (2)		05
Que.2	Question 2 (1) (2)	2	05
	Or		05
	Question 2 (1) (2)		05
Que.2	Question 1	1 & 2	05
	Or		
	Question 2		
Total		25	

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Course Level	5.0		Internal Marks	25
Programme	B.Sc (Honours)		External Marks	25
Semester	4		Practical Internal	-
Course Type	Skill Enhancement Course-4		Practical External	-
Course Credit	02		Prac. Ext. Exam Time	-
Teaching Hours	30		Total	50
Course Code			Exam Duration	1 Hour
Course Title	Conversational Skills -2			

Course Objectives: On successful completion of the course, the students will be able to:

- To introduce advanced conversational skills in students.
- To develop advanced proficiency in English conversational skills.
- To make students able to understand usage of English language in conversations.
- To enable students for writing in formal situations.

Course Learning Outcomes: After completion of the course:

- Students will be able to understand usage of conversational skills.
- Students will be able to make advanced conversations in English.
- Students will be able to understand usage of English language in conversations.
- Students will be able to write in formal situation.

Course Contents

Sem	Unit No.	Syllabi	Teaching Hours
3	1	• Speaking situations- social gathering and networking (introducing self, small talks, networking conversations) • Cross-cultural communications (conversation with visiting foreigners, conversation in foreign lands) • Feedback writing (for visiting a place, for attending a gathering)	15

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	2	• Workplace dialogues (with colleagues, with boss, with HR person, with clients) • Group discussion and debates (how to, preparation drafts, academic topics, social topics) • Email writing (workplace, order, complaint etc)	15
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Suggested Reading:

1. How to talk to Anyone by Leil Londes
2. Business Communication by Urmila Rai and S.M. Rai. Himalaya Publishing House
3. Practical English Usage by Michael Swan
4. English Grammar & Composition by Wren & Martin.

INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam (Mandatory)	13
2	Class Test	03
3	Open book exam/test	03
4	Open note exam/test	03
5	Self-test/ Online test	03
6	Essay/Article writing	03
7	Quizzes/Objective test	03
8	Class assignment	03
9	Home assignment	03
10	Reports Writing	03
11	Research/Dissertation	03
12	Case Studies	03
13	Viva/Oral exam	03
14	Group Discussion	03
15	Role Play	03
16	Paper presentation/Seminar	03
17	Language Lab work	03
18	Interview	03
19	Craft work	03
20	Co-curricular work	03
21	Field Assignment	03

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22	Poster Presentation	03
23	Attendance	03
24	Project Work	03
	Total	25

Note: Sr.No.1 is mandatory. Select any Four from Sr.No.2 to 24. Each Contains three marks. Student should secure 09 Marks for passing in internal Exam

Paper Style

Ques. No.	Particulars	From which Unit	Marks
1	Give appropriate response in following conversation. (5 Marks) Write a dialogue on any one of the following situations. (5 Marks)	1	10
2	Write a workplace dialogue on any one of the two given topics. (5 marks) Write draft for given topics for group discussion or debate. (Two option, 5 Marks)	2	10
3	Write an email on any one of the two given topics.	2	05
	Total Marks		25

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Course Level	5.0	Internal Marks	--
Programme	B.Sc (Honours)	External Marks	--
Semester	4	Practical Internal	25
Course Type	Skill Enhancement Course-4	Practical External	25
Course Credit	02	Prac. Ext. Exam Time	2 Hours
Teaching Hours	30	Total	50
Course Code		Exam Duration	2 Hours
Course Title	Advanced GeoGebra (FOSS) {Practical Based Course}		

Course Objective:

- **Understand and Apply Matrix Operations:** Students will be able to transform matrices into row-echelon form using GeoGebra, determine the rank of matrices and write step-by-step GeoGebra codes for these operations.
- **Analyze Functions Using Software Tools:** Students will use GeoGebra's Function Inspector Tool to explore properties of functions like minima, maxima, roots, derivatives, integrals and curvature enhancing their understanding of function behavior.
- **Graph and Interpret Polar Curves:** Students will plot various polar curves such as rose curves, limacons and cardioids in GeoGebra, understanding their geometric properties and how to represent them mathematically.
- **Compute Series Expansions:** Students will calculate Taylor's and Maclaurin's series for given functions at specific points, visualize these series graphically to see how they approximate the original functions and use CAS view for these computations.
- **Perform Multivariable Calculus:** Students will calculate first and second-order partial derivatives of functions of two variables.
- **Understand and Visualize Curvature:** Students will plot Cartesian and polar curves, calculate their curvature at specific points and graphically illustrate this concept with osculating circles to understand the radius of curvature.
- **Identify and Plot Asymptotes:** Students will learn to find and visually represent asymptotes for various types of curves including rational functions, conics, and trigonometric functions, enhancing their ability to analyze function behavior at infinity.
- **Apply Numerical Methods for Root Finding:** Students will implement and compare the Bisection, False Position and Newton-Raphson methods to find roots of equations, gaining insight into numerical approximation techniques.
- **Solve Ordinary Differential Equations (ODEs):** Using GeoGebra's CAS view, students will solve various types of ODEs including variable separable, homogeneous, linear and exact differential equations, understanding different solution techniques.
- **Verify Mean Value Theorems:** Students will apply Rolle's, Lagrange's, and Cauchy's Mean Value Theorems to specific functions, both verifying these theorems computationally and visualizing their implications graphically.

Course Learning Outcomes:

- **Master Matrix Manipulation:** Students will demonstrate proficiency in converting matrices to row-echelon form and calculating matrix ranks using GeoGebra, including writing and executing corresponding codes.
- **Explore Function Dynamics:** Learners will adeptly use GeoGebra's Function Inspector to analyze various properties of functions, including roots, extrema, derivatives, integrals and curvature for a deeper understanding of function behavior.
- **Visualize Polar Coordinates:** Students will plot complex polar curves like roses, limacons and lemniscates, accurately interpreting their geometric properties through GeoGebra visualizations.
- **Develop Series Approximation Skills:** Students will compute Taylor and Maclaurin series expansions for functions, visually compare these series with the original functions in GeoGebra, and apply these techniques in CAS view.
- **Apply Multivariable Calculus:** Students will compute partial derivatives of functions with multiple variables, evaluate these derivatives at specific points, and understand their implications in three-dimensional space.
- **Analyze Curvature and Osculating Circles:** Students will plot both Cartesian and parametric curves, calculate curvature at specific points, and use GeoGebra to draw osculating circles, enhancing their understanding of curve properties.
- **Identify Asymptotic Behavior:** Students will determine and graph asymptotes for a variety of functions, including rational, trigonometric, and conic sections, to comprehend function behavior as x approaches infinity or negative infinity.
- **Implement Numerical Root-Finding Methods:** Students will apply methods like Bisection, False Position, and Newton-Raphson to find approximate roots of equations, comparing their efficiency and accuracy in different scenarios.
- **Solve Differential Equations:** Students will solve various types of ordinary differential equations using GeoGebra's CAS capabilities, distinguishing between different methods like variable separable, homogeneous, linear, and exact equations.
- **Validate Mean Value Theorems:** Students will apply and visualize Rolle's, Lagrange's, and Cauchy's Mean Value Theorems, connecting theoretical concepts with graphical representations to understand the theorems' real-world implications.

Practical No.		Objective / Aim of Practical
1	(A)	Find row-Echelon form for the following matrices. Write step-by-step GeoGebra codes for each. (i) $A = \begin{bmatrix} 1 & 3 & -3 & -1 & -4 \\ 1 & 4 & 1 & -2 & -2 \\ 2 & 9 & 0 & -5 & -2 \end{bmatrix}$ (ii) $B = \begin{bmatrix} 1 & 0 & -4 \\ 0 & -1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$
	(B)	Find rank of the following matrices. Write step-by-step GeoGebra codes for each. (i) $A = \begin{bmatrix} 1 & 3 & -3 & -1 & -4 \\ 1 & 4 & 1 & -2 & -2 \\ 2 & 9 & 0 & -5 & -2 \end{bmatrix}$ (ii) $B = \begin{bmatrix} 1 & 0 & -4 \\ 0 & -1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$

		(iii) $C = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 2 & 2 \end{bmatrix}$
2	(A)	Find function properties by using Function Inspector Tool like Minimum, Maximum, Root, Integral, Area, Table of points, Tangent at a point, Derivatives upto 2 nd order, Integral, Curvature etc. for the following functions: (i) $f(x) = (x-2)(x-1)(x+1)$ in the interval $(-5, 5)$. (ii) $g(x) = \sin(x)$ in $(-3\pi, 3\pi)$. (iii) $h(x) = e^x$ in $(-10, 10)$. (iv) $m(x) = \log_e(x)$ in $(0, 10)$.
	(B)	Solve the following systems of simultaneous linear equations: (use CAS view) (i) $x + y + z = 3, x - y - z = -1, 2x - y + z = 2$ (ii) $x + y + z + w = 0, x + 3y + 2z + 4w = 0, 2x + z - w = 0$ (iii) $5x + 2y + 2z = 17, 9x + 4y + 2z = 27$ (iv) $2x + 3y = 5, 3x - 2y = 1, 3x + 2y = 7$ (inconsistent) (v) $3x - 5y + 2z + 4w = 2, 7x - 4y + z + 3w = 5,$ $5x + 7y - 4z - 6w = 3$ (inconsistent)
3	(A)	Plot the following polar curves: (i) Rose Curve: $r = a \sin(n\theta)$ or $r = a \cos(n\theta)$ (there will be n leaves if n is odd otherwise $2n$ leaves) (ii) Limacon: $r = b \pm a \sin(\theta)$ or $r = b \pm a \cos(\theta)$, where $a \neq b$ (iii) Cardioid: Limacon is known as cardioid if $a = b$. NOTE: $\Rightarrow$ Polar coordinates are entered using a semi-colon: e.g. (3; pi/3) $\Rightarrow$ The default angle measure is in degrees. This can be changed in Settings > Graphing (cubic icon). $\Rightarrow$ Polar curves can be entered directly: e.g. $r = 3 + 2 \cos(\theta)$ $\Rightarrow$ GeoGebra will plot negative values of r . $\Rightarrow$ You can also use the command : $\text{Curve}[(r; \theta), \theta, \text{start value}, \text{end value}]$ e.g. $\text{Curve}[(2 + \sin(\theta/2); \theta), \theta, 0, 4\pi]$ $\Rightarrow$ You can <u>also</u> make use the following command $\text{Curve}[r(\theta) * \cos(\theta), r(\theta)$ $* \sin(\theta), \theta, \text{start value of } \theta, \text{end value of } \theta]$
	(B)	Plot the following polar curves: (i) Lemniscates: (a) $r^2 = a^2 \cos(2\theta)$ (b) $r^2 = a^2 \sin(2\theta)$. (ii) Spirals: (a) $r = a\theta$ (Spiral of Archimedes) (b) $r\theta = a$ (Reciprocal or Hyperbolic Spiral) (c) $r = e^{a\theta}$ (Logarithmic Spiral)
4	(A)	Obtain Taylor's Series/ Maclaurin's Series expansions of the following functions at the given point a and degree n . Also geometrically visualize how these series expansions coincides the actual functions in graphics view. (i) $f_1(x) = \sin(x)$ at $a = 1$ upto degree $n = 5$ (ii) $f_2(x) = \cos(x)$ at $a = 2$ upto degree $n = 6$ (iii) $f_3(x) = \sin(x)$ at $a = 1$ upto degree $n = 10$ (iv) $f_4(x) = \sin(x)$ at $a = 0$ upto degree $n = 12$
	(B)	Obtain Taylor's Series/ Maclaurin's Series expansions of the following

		functions at the given point a and degree n. Also geometrically visualize how these series expansions coincides the actual functions in graphics view. (use CAS view) (i) $f_1(x) = \sin(bx + c)$ at $a = 1$ upto degree $n = 5$ (ii) $f_2(x) = \cos(bx - c)$ at $a = 2$ upto degree $n = 6$ (iii) $f_3(x) = \tan(bx + c)$ at $a = 1$ upto degree $n = 10$ (iv) $f_4(x) = \sin(cx + d)$ at $a = 0$ upto degree $n = 12$
5	(A)	Find the first-order partial derivatives f_x, f_y of the following functions of two variables. Also find $f_x(2,3)$ and $f_y(3,2)$. (i) $f(x, y) = x^3y^2 + x^2y$ (ii) $f(x, y) = e^{x+y} + \sin\left(\frac{x}{y}\right)$ (iii) $f(x, y) = x \log(x) + \sin^{-1}(xy^2)$
	(B)	To compute the second-order partial derivatives f_{xy}, f_{yx}, f_{xx}, f_{yy} of the functions of two variables of Practical – 5(A). Also find value of each at the point (2,3).
6	(A)	Plot the following Cartesian curves and calculate the curvature at a specific point. Also find the radius of curvature by finding the osculating circle at that specific point. (i) $xy = 4$ at (4, 1) (ii) $\frac{x^2}{16} + \frac{y^2}{25} = 1$ at (4, 0) (iii) $y = 2 \cosh\left(\frac{x}{2}\right)$ at (0, 2) (iv) $y^2 = 12x$ at $\left(\frac{3}{4}, -3\right)$
	(B)	Plot the following Polar/Parametric curves and calculate the curvature at a specific point. Also find the radius of curvature by finding the osculating circle at that specific point. (i) $r = 3(1 + \cos(\theta))$ at (6, 0) (ii) $r = 2 \cos(3\theta)$ at $\left(0, \frac{\pi}{6}\right)$
7	(A)	To find the all asymptotes of the following curves: (i) $x^2 - \frac{y^2}{4} = 1$ (ii) $y(x^2 - 1) = x$ (iii) $x^2y - 3x^2 - 5xy + 6y + 2 = 0$ (iv) $x^3 + 2x^2y + xy^2 - x^2 - xy + 2 = 0$
	(B)	Analyze and plot the asymptotes of the following conics if exists: (i) $y^2 = 4x$ (ii) $x^2 + y^2 = 9$ (iii) $\frac{x^2}{16} + \frac{y^2}{25} = 1$ (iv) $\frac{x^2}{16} - \frac{y^2}{25} = 1$ (v) $xy = 4$
	(C)	To visualize and plot the asymptotes of all trigonometric and inverse trigonometric functions if exists.
8	(A)	Find approximate root of the followings by using Bisection Method corrected upto 4 decimal places: (i) $x^3 - 111 = 0$

		(ii) $x \log_{10}(x) - 1.2 = 0$ (iii) $xe^x - \cos(x) = 0$
	(B)	Find approximate root of the followings by using False Position Method corrected upto 5 decimal places: (i) $x^3 - 111 = 0$ (ii) $x \log_{10}(x) - 1.2 = 0$ (iii) $xe^x - \cos(x) = 0$
	(C)	Find approximate root of the followings by using Newton-Raphson Method corrected upto 7 decimal places: (i) $x^3 - 111 = 0$ (ii) $x \log_{10}(x) - 1.2 = 0$ (iii) $xe^x - \cos(x) = 0$
9	(A)	Solve the following ODE: (use CAS view) (i) $\frac{dy}{dx} = e^{(3x-2y)} + x^2 e^{-2y}$ (VSM) (ii) $\frac{dy}{dx} = (4x + y + 1)^2$ if $y(0) = 1$ (VSM, Particular Solution) (iii) $(x^2 + y^2)dx + 2xydy = 0$ (Homogeneous) (vi) $y - x \frac{dy}{dx} = \sqrt{y^2 - x^2}$ (Homogeneous)
	(B)	Solve the following ODE: (use CAS view) (i) $\frac{dy}{dx} = x^3 - 2xy$ (Linear Diff. Equation) (ii) $(x + 1) \frac{dy}{dx} - y = e^{3x}(x + 1)^2$ (Linear Diff. Equation) (iii) $(2x + 3y - 4)dx + (3x + y + 5)dy = 0$ (Exact Diff. Equation) (iv) $(5x - 7y + 2)dx + (-7x + 5y + 3)dy = 0$ (Exact Diff. Equation)
10	(A)	Verify and visualize Rolle's MVT for followings: (i) $f(x) = x^2 - 2x, \forall x \in [-1, 3]$ (ii) $f(x) = \sin(x), \forall x \in [0, 2\pi]$ (iii) $f(x) = \frac{\sin(x)}{e^x}, \forall x \in [0, \pi]$
	(B)	Verify and visualize Lagrange's MVT for followings: (i) $f(x) = x^2 - 2x, \forall x \in [-1, 3]$ (ii) $f(x) = \ln(x), \forall x \in [1, e]$ (iii) $f(x) = e^x, \forall x \in [0, 1]$
	(C)	Verify and visualize Cauchy's MVT for followings: (i) $f(x) = (x - 1)^2, g(x) = x(x - 1)^3, \forall x \in [0, 2]$ (ii) $f(x) = \sin(x), g(x) = \cos(x), \forall x \in [0, \frac{\pi}{2}]$ (iii) $f(x) = e^x, g(x) = e^{-x}, \forall x \in [0, 1]$

Suggested Reference:

1. <https://www.geogebra.org/search/math%20manual>
2. N.B. Use GeoGebra Calculator Suit

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SEMESTER-4