



Four-Year Undergraduate Program

Bachelor of Science

B.Sc. Microbiology Honors

Faculty of Applied Sciences

Parul University

Vadodara, Gujarat,

India

Faculty of Applied Sciences Bachelor of Microbiology

1. Vision of the Department

Create and nurture a vibrant learning environment built on core values of science, with knowledge of advances in biological sciences is created and disseminated, with satisfaction in teaching and learning

2. Mission of the Department

M1 To offer best quality mentoring of Graduate, Post-graduate & doctoral studies students

M2 To provide research facilities to lead scientific discoveries making global impact

M3 To create skilled human resource to meet the demand of biological industry

M4 To establish collaboration with industries, all other stakeholders & closely work with them to develop most sought of curriculum, improve the skills of students

3. Program Educational Objectives

The statements below indicate the career and professional achievements that the B.Sc. Microbiology curriculum enables graduates to attain.

PEO 1	To develop technical skills (critical investigation, communication, analytical and computer) and human relations skills (group dynamics, team building, organization and delegation) to enable students to transform the acquired knowledge into action.
PEO 2	To inculcate critical analysis and communication skills into students to effectively present their views, both in writing and through oral presentations.
PEO 3	To provide an environment for exploring the Research & Development attitude, to help the students in Research and Development field.

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study

PLO 1	Knowledge	Understand foundational scientific principles to address intricate challenges through diverse solutions.
PLO 2	Problem Analysis	Evaluate and interpret experimental results, drawing conclusions based on acquired data, while also identifying, formulating, and analyzing scientific problems to arrive at solutions using diverse scientific principles.
PLO 3	Designing Solutions	Analyse solutions and execute experiments that showcase their comprehension of the methods and processes involved.
PLO 4	Modern tool usage	Identify, create, select, and apply appropriate techniques, resources and IT tools in the analysis and synthesis of data within limitations.
PLO 5	Communication Development	Learn clear communication through both written and oral formats, capable of explaining complex concepts in understandable terms, learners will effectively engage with the scientific community and society on scientific matters.
PLO 6	Employability	Learn diverse career goals, including scientific, technical, and quantitative roles, the institution informs them about relevant job opportunities through the Placement cell, offering skill enhancement and value-added courses in addition to science subjects to give them a competitive advantage in the job market.
PLO 7	Ethics	Identify a sense of healthy competition among students while also nurturing a strong ethical foundation, including an appreciation for scientific principles and their impact on

		societal, economic, and environmental issues, understand and practice ethical values in both professional and personal spheres, contributing to a responsible society.
PLO 8	Environment and Sustainability	Understand the impact of scientific solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PLO 9	Soft-Skill Development	Learn soft skills like leadership, teamwork, and effective communication to excel in various roles and contribute to societal progress, enhancing academic, professional, and personal growth for self-improvement and collective advancement.
PLO 10	Science and Society	Analyze logical thinking, knowledge, and skills in designing solutions for societal issues, including health, safety, and scientific responsibilities.
PLO 11	Life-long learning	Learn to seek knowledge for personal or professional growth includes promoting volunteering, self-motivation, societal values, and lifelong learning for enhanced competitiveness and employability amidst technological advancements.
PLO 12	Data Analysis and Interpretation	Analyze and interpret scientific data, drawing meaningful conclusions, and communicating results effectively.

5. Program Specific Learning Outcomes

PSO 1	Demand as per recent development	Learn the solutions as per the recent industry defined problems.
PSO 2	Software skill	Remember any apparatus and system with appropriate usage of software tools, and gather data for modelling system.
PSO 3	Analytical skill	Learn apparatus and system with appropriate usage of instruments, and gather data for analytical and research purpose.

Semester - 1						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	00019301AE01	MIL-1 (Basic English I)	2	2	0	0
2	11011401VA01	VAC-1 (Climate change & sustainable environment)	2	2	0	0
3	00019101SE01	SEC-1 Laboratory Best Practices	2	1	0	2
4	11010201DS01	Cell Biology	4	4	0	0
5	11010301DS02	Chemistry	4	4	0	0
6	11010201DS03	Lab-I Cell Biology	2	0	0	4
7	11010301DS04	Lab-II Chemistry	2	0	0	4
8	09010101UE01	University Elective – 1 First aid & life support	4	3	0	2
Total			22	16	0	12

Semester – 2						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	00019302AE04	MIL-2 (Basic English-II)	2	2	0	0
2	00019101SE01	SEC-2 (Mathematical Aptitude)	2	2	0	0
3	00019302VA01	VAC-2 (IPDC including history and culture of India and IKS-I)	2	2	0	0
4	11010302DS01	Biomolecules	4	4	0	0
5	11010102DS02	Fundamentals of Microbiology	4	4	0	0
6	11010302DS03	Lab -I- Biomolecules	2	0	0	4
7	11010102DS04	Lab - II - Fundamentals of Microbiology	2	0	0	4
8	19010002UE01	University Elective – 2 Digital Health	4	4	0	0
Total			22	18	0	8

6. Credit Framework

Semester wise Credit distribution of the program	
Semester-1	22
Semester-2	22
Semester-3	22
Semester-4	22
Semester-5	22
Semester-6	22
Semester-7 (research/honours)	22
Semester-8 (research/honors)	22
Total Credit :176	

Category wise Credit distribution of the program	
Category	Credit
Major Core	120
Minor Stream	00
Multidisciplinary	12
Ability Enhancement Course	10
Skill Enhancement Courses	10
Value added Courses	8
Summer Internship	4
Research Project/Dissertation/OJT	12
Total Credits: 176	

7. Program Curriculum

Semester – 3						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	00019303AE01	MEL-1 Advanced English- I	2	2	0	0
2	00019303VA01	VAC-3 (IPDC including history and culture of India and IKS - 2)	2	2	0	0
3	03010503SE01	SEC-3 Artificial Intelligence	2	2	0	0
4	11010203DS01	Molecular Biology	4	4	0	0
5	11010203DS02	Immunology	4	4	0	0

6	11010203DS03	Lab-I Molecular biology	2	0	0	4
7	11010203DS04	Lab- II Immunology	2	0	0	4
8	17010103UE01	University Elective – 3 Intellectual Property	4	4	0	0
Total			22	18	0	8

Semester – 4						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	00019304AE01	MEL-2 Advanced English- II	2	2	0	0
2	11010004SE01	SEC-4 Bioinstrumentation	2	1	1	0
3	19010204VA01	Positive Mental Health	2	2	0	0
4	11010104DS01	Microbial Physiology and Genetics	4	4	0	0
5	11010104DS02	Bacteriology	4	4	0	0
6	11010304DS03	Biochemical Pathways	4	4	0	0
7	11010104DS03	Lab-I Microbial Physiology and Genetics	2	0	0	4
8	11010104DS04	Lab-II- Bacteriology	2	0	0	4
Total			22	17	1	8

Semester – 5						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	11010105DS01	Agricultural & Industrial Microbiology	4	4	0	0
2	11010105DS02	Microbial Metabolism	4	4	0	0
3	11010105DS03	Medical Microbiology	4	4	0	0

4	11010105DS04	Applied Microbiology	4	4	0	0
5	11010105DS05	Lab-I Agriculture and Environmental Microbiology	2	0	0	4
6	11010105DS06	Lab-II Medical Microbiology and Applied Microbiology	2	0	0	4
7	06010105SE01	SEC – 5 Digital Literacy	2	2	0	0
Total			22	18	0	8

Semester – 6						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	11010206DS01	Recombinant DNA Technology	4	4	0	0
2	11010106DS02	Industrial Microbiology	4	4	0	0
3	11010106DS03	Food and Dairy Microbiology	4	4	0	0
4	11010106DS04	Lab-I Recombinant DNA Technology & Food and Dairy Microbiology	2	0	0	4
5	11010106DS05	Lab-II Industrial Microbiology	2	0	0	4
6	00019306AE01	Professional Ethics & Communication	2	0	0	4
7	11010106IN01	Internship/Mini project	4	0	0	0
Total			22	12	0	8

Semester - 7 Hons						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	11010107DS01	Research Methodology	4	4	0	0
2	11010207DS02	Bioinformatics	4	4	0	0

3	11010207DS03	Virology	4	4	0	0
4	11010107DS04	Parasitology	4	4	0	0
5	11010107IN01	On Job training	6	0	0	0
Total			22	16	0	0
Semester - 7 Research						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	11010107DS01	Research Methodology	4	4	0	0
2	11010207DS02	Bioinformatics	4	4	0	0
3	11010207DS03	Virology	4	4	0	0
4	11010107DS04	Parasitology	4	4	0	0
5	11010107RP01	Research Project	6	0	0	0
Total			22	16	0	0

Semester - 8 Hons						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P
1	11010108DS01	Enzyme Technology	4	4	0	0
2	11010308DS02	Bioethics and IPR	4	4	0	0
3	11010108DS02	Pharmaceutical Microbiology	4	4	0	0
4	11010108D S03	Bioprocess Engineering	4	4	0	0
5	11010108IN01	On Job training	6	0	0	0
Total			22	16	0	0
Semester - 8 Research						
Sr. No.	Subject Code	Subject Name	Credit	L	T	P

1	11010108DS01	Enzyme Technology	4	4	0	0
2	11010308DS02	Bioethics and IPR	4	4	0	0
3	11010108DS02	Pharmaceutical Microbiology	4	4	0	0
4	11010108DS03	Bioprocess Engineering	4	4	0	0
5	11010108RP01	Research Project	6	0	0	0
Total			22	16	0	0

1. Detailed Syllabus

Semester 1

(1)

- a. Course Name:** Basic English-I
- b. Course Code:** 00019301AE01
- c. Prerequisite:** Basic Knowledge of LSRW. To provide students with soft skills that complement their skills, making them more marketable when entering the workforce.
- d. Rationale:** Knowledge of LSRW is essential for students.
- e. Course Learning Objective:**

CLOBJ 1	Remember basic English language terms and concepts.
CLOBJ 2	Understand the main ideas and key details of simple English language materials.
CLOBJ 3	Learn grammar and vocabulary knowledge to construct simple sentences and paragraphs.
CLOBJ 4	Analyze the structure and organization of basic English texts.
CLOBJ 5	Identify the use of language in different contexts and for different purposes.
CLOBJ 6	Remember original written and spoken English language content.

f. Course Learning Outcomes:

CLO 1	Identify and recognize simple grammatical structures and rules in English sentences.
CLO 2	Understand basic English grammar concepts through application in context.
CLO 3	Analyze listening skills to follow and respond appropriately to basic instructions and directions given in English.
CLO 4	Analyze language usage and areas for improvement in pronunciation, grammar, and vocabulary
CLO 5	Learn new vocabulary and grammatical structures learned in class into their communication to demonstrate language fluency and creativity.
CLO 6	Analyze the cultural relevance and appropriateness of language use in various contexts, demonstrating an understanding of cultural sensitivity and communication norms.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	-	100	-	-	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Listening Skills and Hearing: Listening Vs Hearing Types of listening, Traits of good listener, Barriers of listening	7%	3
2	Listening Practice: Listening Practice(Audio & Video)	10%	3

3	Presentation Skills: Defining the purpose of presentation Presentation strategies, how to make an effective presentation? Knowing /Analysing audience, Organizing content and preparing an outline. Traits of a good speaker	3%	2
4	Activity: Crazy Scientist	7%	2
5	Speaking Practice: speaking practice (Elocution	24%	7
6	Reading Skills: Define reading, Reading, Strategies, Techniques of reading, Techniques to read faster	3%	1
7	Reading Practice: Reading Practice (Reading Comprehension)	13%	1
8	Writing Skills: Develop Writing Skills, 7cs of communication, Techniques of writing better, Identifying common errors in writing	10%	4
9	Paragraph Writing: Introduction of Paragraph Writing, Central components of paragraph development, Techniques for paragraph development	3%	3
10	Writing Practice: Note making,Picture Description, Dialogue Writing, Paragraph Writing Completion of story from given points	20%	4
Total		100%	30

i. Text Book and Reference Book:

1. Understanding and Using English Grammar, By Betty Azar & Stacy Hagen | Pearson Education
2. Business Correspondence and Report Writing, By SHARMA, R. AND MOHAN, K.
3. Communication Skills, By Kumar S and Lata P | New Delhi Oxford University Press
4. Technical Communication: Principles and Practice, By Sangeetha Sharma, Meenakshi Raman | Oxford University Press
5. Practical English Usage, By MICHAEL SWAN
6. A Remedial English Grammar for Foreign Student, By F.T. WOOD
7. On Writing Well, By William Zinsser | Harper Paperbacks,2006 | 30th anniversary edition

2.

a. Course Name: Climate change & Sustainable Environment

- b. Course Code:** 11011401VA01
- c. Prerequisite:** Shall have the basic knowledge about environmental studies.
- d. Rationale:** Will understand the basic interface between climate change and sustainability.
- e. Course Learning Objective:**

CLOBJ 1	Understand climate change and its causes.
CLOBJ 2	Learn the greenhouse effect and its role in climate change.
CLOBJ 3	Identify and contrast different approaches to climate change adaptation and mitigation.
CLOBJ 4	Analyze knowledge of climate change to analyze real-world environmental problems.
CLOBJ 5	Learn the ethical implications of various responses to climate change.
CLOBJ 6	Analyze strategies for community engagement in climate change adaptation and mitigation.

f. Course Learning Outcomes:

CLO 1	Identify the complexity and operations of governance systems and processes on international, national, and local levels.
CLO 2	Understand the differences between government and governance and the various ideas and meanings attached to the goal of sustainable development.
CLO 3	Analyze policy-making processes in regard to sustainability issues.
CLO 4	Apply high-quality written and verbal communication skill.
CLO 5	Learn effectively in a team and in tutorial or workshop situations.
CLO 6	Identify scientific principles behind climate change, including the greenhouse effect, and its implications for global ecosystems.

g. Teaching & Examination Scheme:

Teaching Scheme	Evaluation Scheme
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L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Climate Change: Global Climate System Climate Change: Causes and Consequences: Global warming, ozone layer depletion, acid rain, and greenhouse effect case studies: nuclear accidents, chemical disasters, and climatic episodes	33%	10
2	Sustainable Development: Sustainable Development Goals: An overview Climate Change and Sustainable Development: National and State Policies Achieving Sustainable Development Goals: Role of Various Stakeholders Building Partnership for Climate Change and Sustainable Development	34%	10
3	Sustainable Approach to Climate Change: Energy Conservation: Use of Renewable energies: Water, Solar, Wind, Tidal, Geothermal Water conservation techniques: Rain Water Harvesting. Environmental Ethics & Public Awareness: Role of various religions and cultural practices in environmental conservation Sustainable Human Development.	33%	10
Total		100 %	30

i. Text Book and Reference Book:

1. Climate Change and Sustainable Development: Prospects for Developing Countries, By Anil Markandya, Kirsten Halsnæs
2. Climate Change and Sustainable Development Global Prospective, By R.K.Mishra, P.s.Janki Krishna & CH. Laskhmi Kuma

3. This Changes Everything: Capitalism vs The Climate, By Naomi Klein. The Uninhabitable Earth: Life After Warming (TextBook), By David Wallace-Wells.
4. The Uninhabitable Earth: Life After Warming (TextBook) By David Wallace-Wells

3.

- a. **Course Name:** Laboratory Best Practices
- b. **Course Code:** 11010101SE01
- c. **Prerequisite:** Basic knowledge of Biology, Physics and Chemistry
- d. **Rationale:** Curriculum will provide a general understanding of the required laboratory ethics and practices.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the fundamental safety protocols in a Biology, Physics and chemistry laboratory, including the proper usage of Personal Protective Equipment (PPE), knowledge of first aid procedures, and familiarity with the use of fire extinguishers.
CLOBJ 2	Identify and code different types of glassware and chemicals used in laboratory experiments.
CLOBJ 3	Learn pH determination using various methods such as litmus paper, pH strips, and pH meter for water samples.
CLOBJ 4	Learn Standard Operating Procedures (SOPs) Laboratory equipment's.
CLOBJ 5	Remember the analysis of organic compounds, specifically detecting special elements (N, S, and halogens) using the Lassaigne test.
CLOBJ 6	Learn safe storage and handling practices for chemicals and glassware, including proper labeling, storage conditions, and awareness of compatibility issues

f. Course Learning Outcomes:

CLO 1	Understand safety proficiency in the laboratory, including the correct selection and use of Personal Protective Equipment (PPE), first aid procedures, and efficient utilization of fire extinguishing equipment.
CLO 2	Learn competence in identifying, coding, and handling various glassware and chemicals commonly used in laboratory experiments.
CLO 3	Understand advanced analytical skills by accurately determining pH levels in water samples using litmus paper, pH strips, and pH meters.
CLO 4	Learn hands-on experimental skills by successfully implementing SOPs.
CLO 5	Identify ethical awareness and responsibility by identifying and addressing potential hazards, fostering a culture of safety and responsibility within the laboratory setting.
CLO 6	Remember proficiency in safe storage practices, including proper labeling, storage conditions, and the implementation of compatibility guidelines for chemicals and glassware.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
1	-	2	2	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Course Content	W - Weightage (%), T – Teaching	W%	T
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1	Unit 1 Introduction to Good Laboratory Practices (GLP) and Standard Operating Procedures (SOP) History, Scope, and Fundamental Points of GLP (Rules and results, Quality assurance, Quality Control, Quality engineering), Laboratory hierarchy and SOP Levels of Laboratories, Log Book Maintenance, Basic SOPs for instrument handling and Maintenance, Personal Protective Equipment (PPE), record technical and administrative improvements.	33%	10
2	Unit 2 Laboratory rules and Protocols General Rules/Protocols for Lab Safety measures (laboratory safety showers, eyewash stations, and fire extinguishers, exit routes), Precaution and Safety in handling of chemicals (chemical inventory list, applicable safety data sheets (SDS), departmental laboratory safety manual), Laboratory tools (records of certification, maintenance, or repairs), Glassware and instruments.	34%	10
3	Unit 3 Record Keeping and Interpretation Keeping data records, its analysis by using statistical and mathematical tools. Result analysis and its interpretation (Raw data and Data Collection, Final report, summary of findings, discussion and reference.	33%	10
Total		100 %	30

i. Text Book and Reference Book:

1. Handbook Good Laboratory Practices-World health organization (WHO)
2. Life science protocol manual (2018)-DBT star college scheme
3. Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2021)

k. Experiment List

Sr. No.	Name of the Experiment
1	Basic knowledge of analytical chemistry (Molarity, Normality, Solution preparation, sample collection, labelling).
2	Micropipette handling and calibration.
3	Use of Weighing balance and its calibration and maintenance.
4	Storage and Transport of Chemicals Safely.
5	Applicable safety data sheets Personal Protective Equipment (PPE).
6	Sample/Chemical/E-waste disposal.
7	Introduction to BSL.

4.

a. **Course Name:** Office Automation

b. **Course Code:** 0501001UE01

c. **Prerequisite:** Basic computer literacy.

d. **Rationale:** The objective of this course is to familiarize students with concepts of fundamentals of Microsoft Office, Excel, PowerPoint and Outlook for working of computer and its application.

e. **Course Learning Objective:**

CLOBJ 1	Learn the common software applications used for office automation.
CLOBJ 2	Identify the purpose and benefits of office automation in modern workplaces.
CLOBJ 3	Understand the use of office automation software to create documents, spreadsheets, and presentations.
CLOBJ 4	Analyze the impact of office automation on organizational structures and workflows.
CLOBJ 5	Analyze the effectiveness of office automation systems in improving workplace productivity.

CLOBJ 6	Learn an integrated office automation system tailored to the needs of a fictional business.
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f. Course Learning Outcomes:

CLO 1	Understand Computer System
CLO 2	Learn Computer System
CLO 3	Analyze Internet
CLO 4	Understand and execute on Word Document.
CLO 5	Analyze Excel Sheet and can perform calculation on Data.
CLO 6	Understand the risk of human error by automating data entry, calculations, and other processes

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to Office Automation: Overview of Office Automation, Importance and Benefits of Office Automation, Role in Modern Work Environments, Integration with Business Processes, Challenges and Considerations.	8%	4
2	Introduction of Computer: Overview of Computer, Computer Input and Output devices, Operating System, hardware and Software Introduction to Ram, Rom, CPU and more devices.	8%	4

3	Microsoft Word: Introduction to MS Word, Getting Familiar with the Interface, Creating a New Document, Basic Text Formatting, Bold, Italic, Underline), Aligning Text (Left, Center, Right), Saving and Opening Documents, Navigate Through a Document, Insert hyperlinks, Search for text, Replace, Create bookmarks, Move to a specific location or object in a document, Apply document themes, Apply document style sets, Insert headers and footers, Insert page numbers, Format page background elements, Create a numbered or bulleted list, Change bullet characters or number formats for a list level, Define a custom bullet character or number format.	25%	11
4	Microsoft Excel: Introduction to MS Excel Create a workbook, Search for data within a workbook, Change worksheet tab color, Rename a worksheet, Insert and delete columns or rows, Change workbook themes, Adjust row height and column width, Insert headers and footers, Hide or unhide worksheets, data validation, Duplicate Values, Apply styles to tables, Filter records, Sort data by multiple columns, Change sort order, Remove duplicate records, Perform calculations by using the SUM function, MIN and MAX functions, COUNT function, AVERAGE function, Create a new chart, Resize charts, Save a workbook as a template, Manage workbook versions, Protect a worksheet	25%	10
5	Microsoft PowerPoint: Create a Presentation, Insert and Format Slides, Modify Slides, Handouts, and Notes, Configure a Presentation for Print, Configure and Present a Slide Show, Insert and Format Text, Insert and Format Shapes and Text Boxes, Insert and Format Images, Order and Group Objects, Insert and Format Tables, Insert and Format Charts, Insert and Format SmartArt graphics, Apply Slide Transitions, Animate Slide Content. Set Timing for Transitions and Animations.	17%	8
6	Microsoft Outlook: Create messages, Create and send	17%	8

	messages Configure message, Format messages, Format text Apply, themes and styles, Apply styles, Create hyperlinks, Insert images, Manage schedules, Insert memorized content, Insert signatures, Configure calendar settings ,Work with multiple calendars Share calendar information, Create appointments and events Create meetings Manage calendar items, Create tasks Manage tasks Create and manage notes, Create journal entries, Create and manage contacts Create and modify contact records Store contact records Share contact records and address books.		
Total		100 %	45

i. Text Book and Reference Book:

1. Digital Logic and Computer Design (Textbooks), By Morris Mano | PHI
2. Introduction to Information Technology, By ITL Education Solution Limited | Pearson Education | 2012
3. MS OFFICE 2007, By Vikas Gupta | Wiley
4. Computer Fundamentals, By Anita Goel | Pearson Education | 2011
5. Digital Fundamentals, By Thomas L Floyd | Pearson

K. Experiment List:

1	Case study on salary calculation Calculate Allowance based on given Condition. 1. HRA is 10% on Basic Salary if Salary more than 20000. 2. DA is on 25% on Basic Salary. 3. Medical Allowance (MA) = Executives get MA Rs 1000, Officers get MA Rs 700 & Assistants get MA Rs 500 4. Calculate Gross Salary. Gross Salary = Total of Basic + HRA + DA + MA 5. Calculate Professional Tax Upto 5000 = 0, upto 1000 = 60, upto 15000 = 100 & over 15000 = 150 6. Calculate Annual Salary 7. Calculate Income Tax Upto 100000 = 0, then 50000 = 10%, then 100000 = 20%, over 250000 = 30% Hint:Formula =IF(K2<=100000,0,IF(K2<=150000,(J2-100000)*10%,IF(K2<=250000,(K2-150000)*20%+5000,(K2-250000)*30%+25000))) 8. Calculate Net Salary Payable Annual salary - income tax
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2	Formatting alignment and creating table 1. Type in the Title Microsoft Word Computer Training Manual 2. Text formatting: Times New Roman font, size 14, Bold and Blue. Paragraph formatting: Align Center. 3. Type in the first paragraph. Text formatting: Arial font, size 11. Paragraph formatting: Align Justify, First Line Indent at 0.5 Type the notes
3	Word art and clip art Prepare visiting card for caterer service in word 2007 Prepare interactive word document (apply all formatting style)
4	Macro creating macro
5	Invitation letter format The format of invitation is as shown below: Anand Institute of Information Science, Shri. Ramkrishna Seva Mandal Opp. Town Hall, Anand 388 001 Ph. No. (02696) 266062 To, The Director/Principal, The name of Institute _____ The address of Institute _____
6	Work sheet exercise 1. Insert a column Number of Teams between columns Year and Tickets sold with values Insert a row between row 3 and row 4 with values Delete column Revenue Rename the Sheet1 with name Format cells Delete Sheet3. 6. Hide row 4. 7. Insert a sheet and rename it with name
7	Table exercise Complete the following tasks: a) Widen the first column to 15. b) Add a row beneath the details on Southampton to show the average monthly rainfall. c) Add a new column the rows holding the London and Sheffield rainfall statistics. Enter the following details: Newcastle 65 63 57 50 39 21 f) Copy the appropriate formula to obtain the total rainfall for Newcastle during the period.
8	Table column exercises. Change the column width of column B to 15. 2. Change column width of column D to G to 20. 3. Change column width of column A and B to 14 4. Calculate Total Sales for each item and store result in column D. Hint: Total sales=Quantity * Unit Price. 5. Calculate Total Sales for all the items and store result in cell B6. 6. Copy Unit Price for PC in cell D7. Move Total sales from cell B6 to D8.
9	Insert remove columns of table Complete the following tasks: a) Add a Units Used column to show the number of units of electricity used by each customer (Hint: Subtract the Previous Reading from the Present Reading). b) The cost of one unit of electricity is Rs.0.08. Add a Unit Cost column to show the cost of one unit. (This column will contain 0.08 in all of the relevant cells). c) Add a Units Charge column to

	show the total cost of the units used by each customer. (Hint: Unit Cost * Units Used) d) There is a standing charge of Rs.13.60 on each customer's account. Add a column to display this Standing Charge. (This column will contain Rs.13.60 in all of the relevant cells).
10	Math functions The functions and commands required to solve the following assignment are as follows: Enter data - labels and values 1. Editing cell contents 2. Saving a spreadsheet 3. Altering column widths 4. Using the SUM function 5. Adding a new row after the last row of data 6. Adding a new column after the last column of data 7. Copying a formula 8. Using the AVERAGE, MIN, MAX function 9. Inserting a new row between existing rows Inserting a new column between existing columns
11	Table formatting using background color Format the Student Grades so that your spreadsheet looks like the one below (you can use different colours, if you like).
12	Calculate total sale and commission based on given details in table
13	Filter data of excel sheet 1. Count number of order in Boston. 2. Count number of Microwave order. 3. Count number of journeys with truck 3. 4. Count number of Peter White journeys. 5. How many times is no. of items less than 20. 6. Display sum of refrigerator items. 7. Display sum of washing machine items. 8. Display sum of items transported by truck 4. 9. Sum of items transported by trucks. 10. Number of microwave orders in Boston . 11. Number of Peter White journeys with truck 1. 12. Number of orders in Boston after 2/3/2013: 13. Number of orders between 2/3/2013 and 2/6/2013: 14. sum of microwaves transported to NY: 15. sum of items transported to Pittsburgh by truck 1: 16. sum of items ordered between 2/3/2013 and 2/6/2013: 17. Sum of items transported to NY, Baltimore and Philadelphia
14	Conditional formatting do conditional formatting on the excel sheet in given data
15	Sorting sort given data of excel sheet
16	Typing exercise aq1 qa sw2ws de3ed fr4rf gt5tg queen 11 queens 1 apple 11 apples 2 wishes 22 wishes 2 swims 22 swims eddies 33 eddies 3 deeds 33 deeds 4 roses 44 roses 4 fish 44 fish tugs 55 tugs 5 goats 55 goats
17	Water mark and header footer inserting and removing
18	Power point presentation creating presentation

19	PPT add timing and sound effects
20	Access create data base, tables create db, tables
21	Access relations between tables relations between tables

5.

- a. **Course Name:** Cell Biology
- b. **Course Code:** 11010201DS01
- c. **Prerequisite:** Basic knowledge of biology and cells.
- d. **Rationale:** The curriculum will provide a general understanding of the related disciplines with holistic knowledge generation in cells, organelles, and transport systems.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.
CLOBJ 2	Identify how these cellular components are used to generate and utilize energy in cells.
CLOBJ 3	Remember the cellular components underlying mitotic cell division.
CLOBJ 4	Analyze and apply knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

- f. **Course Learning Outcomes:**

CLO 1	Understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
CLO 2	Understand a strong foundation on the basic unit of life
CLO 3	Remember a strong foundation for the functions of the cell.
CLO 4	Apply their knowledge of cell biology to selected examples of changes or losses in cell function
CLO 5	Analyze knowledge about the cellular components underlying mitotic cell

	division
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g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
Lecture Hrs/ Week	Tutorial Hrs/Week	Lab Hrs/Week	Credit Hrs/Week	Internal Evaluation			ESE		Total
				T	CE	P	Theory	P	
4	-	-	4	20	20	-	60	-	100

T- Theory; P- Practical; CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Basics of cell structure and function: Origin of lifetime scale of cell biology, Introduction and classification of organisms by cell structure, cytosol, compartmentalization of Prokaryotic and eukaryotic cells (Plant & Animal). Cell biology by numbers Cell Membrane and Permeability: Organization of Fluid Mosaic model, Cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments	25%	15
2	Cell organization: Structure, functions of cell organelles: Endoplasmic reticulum, Golgi complex, Microbodies (Lysosomes, Peroxisome, vesicles) Ribosomes, Vacuoles, Mitochondria, Chloroplasts, Nucleus, PXo bodies, apoplast	25%	15
3	Cell division and cell cycle: Cell division and Cell Cycle: Amitosis, Mitosis, Meiosis: a special type of cell division, phases and components of the cell cycle. Regulation of cell cycle (Check points). Cancer cell & its	25%	15

	types, Properties. Cell senescence, apoptosis and necrosis, Cellular ageing and cell death.		
4	Membrane transport and cell signaling: Membrane transport: Active and passive transport, transport of small molecules, ATP powered pump, symporters, antiporters, ion channels, non-gated ion channels and resting potential, voltage gated ion channel and action potential, gap junctions. Basics of Cell signaling-introduction, types-autocrine, paracrine and endocrine, Cell signaling pathways -Jak/STAT and receptor tyrosine kinase.	25%	15
Total		100%	60

i. Text Book and Reference Book:

1. Campbell Biology. 9th edition
2. Molecular biology of cells: Lodish
3. "Molecular Biology of the Cell" by Bruce Alberts et al.
4. "Essential Cell Biology" by Bruce Alberts et al.
5. "Cell Biology" by Thomas Pollard, William Earnshaw, and Jennifer Lippincott-Schwartz.
6. "The Cell: A Molecular Approach" by Geoffrey Cooper.

(6)

- a. Course Name:** Cell Biology
- b. Course Code:** 11010201DS03
- c. Prerequisite:** Basic knowledge of biology and cells.
- d. Rationale:** The curriculum will provide a general understanding of the related disciplines with holistic knowledge generation in cells, organelles, and transport systems.
- e. Course Learning Objective:**

CLOBJ 1	Identify safety handling and regulation of laboratory facility.
CLOBJ 2	Learn how to record, keep and analyze laboratory data with accuracy.
CLOBJ 3	Analyze minimization of Errors related with handling of laboratory

	accessories and equipment's.
CLOBJ 4	Learn Standard Operating Procedures (SOPs) Laboratory equipment's.

f. Course Learning Outcomes:

CLO 1	Apply basics of equipment to observe cells and its organelle
CLO 2	Identify basic experiments to understand cellular mechanisms
CLO 3	Evaluate different cell and tissue from various living sources
CLO 4	Analyze the organelle and cellular components practically

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	40	-	60	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Experiment List:

Sr. No.	Experiment List
1	Structure and working of microscopes (Simple microscope, Compound microscope)
2	To study plant and animal cell from permanent slide mount.
3	To study the structure of plant cell through temporary mounts (Monocot/Dicot).
4	To study the structure of animal cells by temporary mounts-squamous epithelial cell from cheek

5	Effect of hypotonic and hypertonic salt solutions on onion cells
6	To prepare temporary stained squash from root tips of <i>Allium cepa</i> / <i>Pisum sativum</i> and to study the various stages of mitosis.
7	Study the effect of temperature, organic solvent on semi permeable membrane.
8	Study of plasmolysis and deplasmolysis on <i>Rhoeo</i> leaf.
9	Cell cycle halt.
10	Preparation meiotic chromosomes from <i>datura</i> /hibiscus pollen grain/gonads of insects.
11	Spotting -Cell organelles

i. Text Book and Reference Book:

1. Celis JE (ed) (1998) Cell Biology: A Laboratory Handbook, 2nd edn. San Diego: Academic Press.
2. Lacey AJ (ed) (1999) Light Microscopy in Biology: A Practical Approach, 2nd edn. Oxford: Oxford University Press.
3. Paddock SW (ed) (1999) Methods in Molecular Biology, vol 122: Confocal Microscopy Methods and Protocols. Totowa, NJ: Humana Press.
4. Boon ME & Driver JS (1986) Routine Cytological Staining Methods. London: Macmillan
5. Hayat MA (1989) Cytochemical Methods. New York: Wiley-Liss

7.

a. Course Name: Introduction to MATLAB Programming

b. Course Code: 03010901UE01

c. Prerequisite: Fundamental Knowledge of Mathematics.

d. Rationale: An Introduction to MATLAB Programming" course is essential because MATLAB is widely used in scientific and engineering fields for data analysis, simulations, and algorithm development. Its user-friendly interface and high-level language allow beginners to quickly grasp fundamental programming concepts and focus on problem-solving. The course equips learners with valuable skills for data visualization, numerical computing, and rapid prototyping, enhancing their capabilities and employability in diverse domains.

e. Course Learning Objective:

CLOBJ 1	Recall MATLAB syntax for basic operations.
CLOBJ 2	Explain the purpose of using MATLAB for numerical computing.
CLOBJ 3	Apply MATLAB syntax to solve simple mathematical problems.
CLOBJ 4	Analyze and debug simple MATLAB code.
CLOBJ 5	Evaluate the efficiency of MATLAB algorithms for solving specific problems.
CLOBJ 6	Create MATLAB-based solutions to real-world engineering or scientific problems.

f. Course Learning Outcomes:

CLO 1	Navigate the MATLAB environment with confidence, effectively utilizing its features and tools for programming and data analysis.
CLO 2	Manipulate matrices and arrays, perform basic operations, and visualize data using 2D and 3D plots for effective data exploration and representation.
CLO 3	Apply programming concepts like control statements, loops, and logical operations to write structured MATLAB code for problem-solving.
CLO 4	Create and use user-defined functions, promoting code reusability and modular design in MATLAB programs.
CLO 5	Work file input/output, enabling data exchange with external sources, and utilize the Symbolic Math Toolbox for performing symbolic computation.
CLO 6	Develop the ability to independently solve problems using MATLAB.

h. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	

3	-	2	4	20	20	20	60	30	150
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L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Getting Started with MATLAB: Introduction to MATLAB, history, features, and uses, MATLAB desktop, basic commands, variables, and data types, performing arithmetic operations and using functions.	13%	6
2	Working with Matrices and Arrays: Creating Matrices and Arrays, Array Operations and Indexing, Logical Operations and Relational Operators	18%	8
3	Data Visualization in MATLAB: Visualizing data using 2D plots and 3D Plot, Customizing Plots, Enhancing plots with titles, labels, and formatting.	18%	8
4	Programming with MATLAB: Conditional Statements (if-else), loops (for and while), Vectorization and Logical operation	18%	8
5	Working with Files and Symbolic Math: Reading from and writing to files, data import/export, performing symbolic computations using Symbolic Math Toolbox	15%	7
6	Reading Skills: Define reading, Reading Strategies, Techniques of reading, Techniques to read faster	18%	8
Total		100%	45

I. Text Book and Reference Book:

1. MATLAB : PROGRAMMING FOR ENGINEERS (TextBook), By Chapman, Stephen J ., | Thomson Asia Pvt Ltd.
2. Mastering Matlab, A Comprehensive tutorial and reference, By Duane Hanselman and Bruce Littlefield.

3. Getting Started with MATLAB-7 (TextBook), By Rudra Pratap | OXFORD University Press

k. Experiment List with Course Learning Outcome:

1	Basic Arithmetic Operations Write a MATLAB script that takes two user-input numbers, performs basic arithmetic operations (addition, subtraction, multiplication, division), and displays the results.
2	Matrix Manipulation Create a 3x3 matrix with random integers. Implement a function that takes this matrix as input and returns the sum, mean, and maximum value of its elements.
3	Plotting Data and Interpretation Generate a set of x and y values using MATLAB. Plot the data as a line graph, add appropriate labels, and customize the plot appearance
4	Control Statements Write a MATLAB script that takes a user-input number and checks if it's positive, negative, or zero using if-else statements. Display the result accordingly.
5	Fibonacci sequence and usages Create a MATLAB function that generates the first n elements of the Fibonacci sequence and returns them in an array
6	File Input/Output and application Read data from a CSV file into MATLAB, perform some data manipulation (e.g., finding the average), and save the results in a new CSV file.
7	Symbolic Math Use the Symbolic Math Toolbox to solve a simple algebraic equation and display the result in symbolic form.

8.

a. Course Name: First Aid & Life Support

b. Course Code: 09010101UE01

c. Prerequisite: Basic computer literacy. Shall have the basic knowledge about anatomy and physiology of human body.

d. Rationale: Will gain basic knowledge about first aid & life sciences.

e. Course Learning Objective:

CLOBJ 1	Recall the steps to assess an emergency situation.
CLOBJ 2	Explain the importance of timely and effective first aid.

CLOBJ 3	Demonstrate the correct procedures for administering CPR.
CLOBJ 4	Analyze a given scenario to determine the appropriate course of action in providing first aid.
CLOBJ 5	Assess the quality of first aid provided in real-life emergency situations.
CLOBJ 6	Design a comprehensive first aid plan for a specific setting or event.

f. Course Learning Outcomes:

CLO 1	Understand the importance of first aid in emergency situations.
CLO 2	Demonstrate the ability to assess the scene of an emergency.
CLO 3	Identify and prioritize different types of injuries and illnesses.
CLO 4	Learn and practice CPR techniques for adults, children, and infants and use of automated external defibrillators (AEDs) and how to use them.
CLO 5	Understand the importance of infection control in wound care.
CLO 6	Analyze signs and symptoms of shock and how to provide first aid for different types of burns and how to assess and provide first.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Introduction to first aid: Aims of first aid	7%	4

	The first aider. First aid and the law. Indian good Samaritan protection guidelines. Duty of giving care consent of the person in need Privacy Negligence. Dealing with an emergency. Top-to-toe assessment. Hygiene and hand washing. First aid overview flow chart		
2	Assessment of patients with fractures, wounds, and bleeding: Brief Anatomy of the skeletal system Fractures (injuries to bones). Injuries and fractures to the head, neck and spine. Injuries and fractures to the cheekbone, nose and lower jaw. Fracture of the cheekbone or nose. Fractures of the lower jaw. Injuries to the shoulder, ribs or breastbone. Injuries or fractures of the shoulder Injuries and fractures of the collarbone. Rib injuries and fractures. Fractures of the breastbone. Injuries to the arm, elbow, wrist, hand or Injuries and fractures of the arm(upper arm, forearm, wrist) Injuries and fractures of hand or fingers. Injuries to the pelvis, lower limbs, knee, ankle or feet. Injuries and fractures of the pelvis Injuries and fractures of the leg (thigh or lower leg) or ankle. Fracture of the knee cap (patella) Injuries and fractures of foot or toes Dislocations (injuries to joints) Strains and sprains (injuries to ligaments, muscles and tendons)	10%	6
3	Respiratory emergencies: Respiration The respiratory system No breathing or difficult breathing When to refer the casualty to a healthcare facility Drowning Remove the victim out of the water Strangulation and hanging Choking Swelling within the throat Suffocation by smoke or gases Asthm	10%	6
4	Care of burns: The skin Burn wounds First, second and third degree burns Type of burns by origin Danger of burn Dry burns and scalds (burns from flames, hot surfaces, steam, Care of minor burns (small first and second degree burns) Specific burn locations Electrical burns and	8%	5

	electrocution by electricity or lightning Chemical burns Sunburns, snow/welders eyes, heat exhaustion and heat stroke Heat exhaustion Heatstroke Frostbites Prevention of burns Fever Hypothermia		
5	Lifesaving procedures in emergency & shock: The heart and the blood circulation, Heart and blood circulation, Blood pressure, Pulse, The blood, Chest discomfort, Bleeding, First aid for bleeding (in general), Resuscitation (basic CPR), Resuscitation of a person who is not breathing or not breathing normally, Resuscitation of baby/child (less than one year old)	8%	5
6	Head trauma & stroke: The nervous system, The central nervous system, The peripheral nervous system (PNS), Unconsciousness, Head injuries, Concussion, Cerebral compression, Skull fractures, Stroke, Fits – convulsions - seizures	10%	6
7	Gastrointestinal tract, diarrhea, food poisoning and diabetes: Review of anatomy and physiology of gastrointestinal tract, Diarrhoea, Prevent dehydration, Food poisoning, Diabetes, Type 1 diabetes, Type 2 diabetes, Gestational diabetes (diabetes during pregnancy), Diagnosis, Hyperglycaemia, Symptoms of hyperglycaemic coma or diabetic coma, Hypoglycaemia	10%	6
8	Senses, foreign bodies in eye, ear, nose or skin and swallowed foreign Objects: Review of anatomy and physiology of the special senses, Foreign body in the eye, Foreign body in the ear, Foreign body in the nose, Foreign body in the skin, Swallowed foreign objects	10%	6
9	Urinary system, reproductive system and emergency childbirth: Review of anatomy and physiology of Urinary & Reproductive system, Male reproductive system, Female reproductive system, Pregnancy, Stages of labour and giving birth, Aftercare of the mother, Medical conditions and pregnancy, Diabetes, High blood pressure, Infections, Prevention of sexually transmitt	10%	6

	diseases (STD), Sexually transmitted infections, Reducing the risk of STDS/STIS, Emergency childbirth		
10	Psychological first aid: Definition of psychological first aid, Traumatic crisis, (psychological) shock phase, Reaction phase, Processing phase, Reorientation phase, Behave calmly, Listening to the affected person, Physical contact, Providing psychological first aid to all	7%	4
11	Specific emergency situations and disaster management: Emergencies at school, Emergencies at work, Road and traffic accidents, Emergencies in rural area, Disasters and multiple casualty accidents Emergency triage	10%	6
Total		100%	60

i. Text Book and Reference Book:

1. First aid handbook: Fast and effective emergency care (TextBook), By Dr. Pipa Keech | 3rd
2. Until Medical Help Arrives: First aid Book (TextBook), By Dr. H. V. Sardesai | 1 st Edition, Pub. Year 2022
3. First aid manual, (TextBook), By UK's Leading First aid providers | 11th edition:, Pub. Year 2021

9.

a. Course Name: Basic Photography

b. Course Code: 18010201UE01

c. Prerequisite: 1) Understanding of Basic Computer Skills 2) Media Literacy 3) Creative Vision 4) Passion to learn

d. Rationale: Taking a basic photography course can be incredibly helpful for anyone looking to improve their photography skills. Not only will you learn about the technical aspects of photography, but you'll also gain a greater appreciation for the art form and discover your own unique style.

e. Course Learning Objective:

CLOBJ 1	Identify different types of camera lenses and their uses.
CLOBJ 2	Understand the relationship between aperture, shutter speed, and ISO in controlling exposure.
CLOBJ 3	Analyze the ability to use different shooting modes (e.g., manual, aperture priority, shutter priority) effectively.
CLOBJ 4	Analyze photographs based on technical and aesthetic criteria.
CLOBJ 5	Understand the effectiveness of different photographic techniques in conveying a message or story.
CLOBJ 6	Identify original photographic works that demonstrate a mastery of technical skills and artistic expression.

f. Course Learning Outcomes:

CLO 1	Identify different types of cameras, lenses, and photographic equipment.
CLO 2	Remembering the principles of exposure, including aperture, shutter speed, and ISO, and how they affect an image.
CLO 3	Apply the principles of exposure to control the outcome of a photograph in different lighting conditions.
CLO 4	Analyze photographs to understand how different exposure settings and compositional techniques were used.
CLO 5	Evaluate photographs based on their technical and aesthetic qualities.
CLO 6	Identify photographs that demonstrate a mastery of exposure, composition, and lighting techniques.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	4	4	20	20	20	60	30	150

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Digital Camera Mechanism: A basic photography course will help you understand the features of a Digital camera Mechanism, such as aperture, shutter speed, ISO, and how to use them effectively to create the kind of photos you want. Characteristic of Lens: Different focal lengths has different aesthetical use. According to need we'll choose our Lens. Aesthetic of Composition: In terms of Visual Experience composition is a very important element. It Is the arrangement of visual elements within the frame of the photograph.	33%	30
2	Experience the Metadata: Metadata is actually the technical information about the photograph, Using RAW technology we can manipulate the metadata through 'Photoshop'. Experiment on Expression: An Image is actually the expression of the photographer. How does he/she see a particular thing or incident. In Digital era we can do various experiment on our expression and enhance the expression. Business and Marketing for Photographers: This is the most crucial part of the field, through the curriculum we'll learn how to sell or exhibit our photograph, how to take part in various competition and learn about the present marketing strategy.	34%	30
3	Documentary Photography: Apart from the fiction, there is parallel world of documentary Photography. Great photographers like	33%	30

	Kevin Carter, Danish Siddiqui has devoted their life in Documentary Photography and Photo Journalism. Students need to go out and Practically grab some images from daily livelihood of the society. Photographers Study: Students need to study great photographers and their work both from fiction and non- fiction genre		
Total		100%	60

i. Text Book and Reference Book:

1. Basic Photography, By Michael Langford | Focal Press
2. Digital Photography complete course: Everything you need to know in 20 weeks, By Patel, N. | DK Publishers, USA, Pub. Year 2021
3. Handbook of Photography, By James A. Folts & Ronaldo P. Lovel

k. List of Experiments:

Sr. No.	Basics of Photography Lab
1.	Landscape
2.	A picture that reflects you
3.	A photostory with 3 pictures or 5 pictures
4.	Photos on a particular topic
5.	Assignment for photography

Semester-2

a. Course Name: Biochemistry

b. Course Code: 11010302DS01

c. Prerequisite: Basic knowledge of biological molecules and its chemistry

d. Rationale: Curriculum will provide a general understanding of the related disciplines with a holistic knowledge generation in biological sciences.

e. Course Learning Objective:

CLOBJ 1	Understand the detailed knowledge of biomolecules for living systems.
CLOBJ 2	Identify basic concepts of structural organization and characterization of proteins
CLOBJ 3	Learn about Oligosaccharides and lectin interactions in biochemical processes
CLOBJ 4	Understand the structure of DNA and RNA and their types

f. Course Learning Outcomes:

CLO 1	Learn Biochemistry and appreciation for chemical basis of biological processes.
CLO 2	Analyze an in-depth understanding of chemical reaction mechanisms in biological processes.
CLO 3	Learn problem solving and analytical skills through case studies, research papers and hands on- experience.
CLO 4	Understand the knowledge and skill gap between academic out and industry requirements.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	-	-	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Unit:1. Introduction to Biochemistry Chemistry of Life: Elements of Life, Atomic structure of molecules, A detailed description of chemical bonds with respect to biology Water and Life: Properties of water contributing to earth's suitability for life (Cohesion, Moderation of temperature, floating of ice on liquid water, Water-The solvent of life) Hydrophobic interactions. Acid-base and Buffers: Introduction to acid and bases, pH Scale, Strong and weak acid-bases, Buffers & Its biological importance.	25%	15
2	Unit:2. Carbohydrates Structure and general features of carbohydrates (Mono-di and polysaccharides), Physical, chemical and optical properties of carbohydrates, Structure and role of biologically important polysaccharides (Proteoglycan, glycoprotein and glycolipids).	25%	15
3	Unit: 3. Proteins Structure and classification of amino acids, Physical chemical and optical properties of amino acids,	25%	15

	Different level of structural organization of protein, Denaturation and renaturation of protein, Fibrous and globular proteins.		
4	Unit:4. Lipids and Nucleic Acids Lipids: Structure and classification of Fatty acids, Physical and chemical properties of fatty acids, Introduction to lipids- TAG, Wax, Structural lipids in membranes Nucleic Acids: General introduction to nucleic acid (DNA&RNA) and nucleotides, Structure of double stranded DNA and its organization in nucleus, DNA- A genetic material.	25%	15
Total		100%	60

i. Text Book and Reference Book:

1. Campbell Biology. 9th edition
2. Molecular biology of cells: Lodish
3. "Molecular Biology of the Cell" by Bruce Alberts et al.
4. "Essential Cell Biology" by Bruce Alberts et al.
5. "Cell Biology" by Thomas Pollard, William Earnshaw, and Jennifer Lippincott-Schwartz.
6. "The Cell: A Molecular Approach" by Geoffrey Cooper.

(2)

a. Course Name: Lab-1 (Biochemistry)

b. Course Code: 11010302DS03

c. Prerequisite: Basic knowledge of lab techniques in biology and chemistry.

d. Rationale: Curriculum will provide an in-depth understanding of chemical reaction mechanisms in biological processes.

e. Course Learning Objective:

CLOBJ 1	Understand the basic knowledge of biomolecules and its structure.
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CLOBJ 2	Learn about the biomolecules and their function.
CLOBJ 3	Learn about different biochemical pathways
CLOBJ 4	Understand experiments at biomolecular level.

f. Course Learning Outcomes:

CLO 1	Understand the concepts of cellular structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
CLO 2	Analyze the foundation on the basic unit of life.
CLO 3	Remembering biomolecules and their function
CLO 4	Understand biomolecular aspects of life processes.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	3	-	-	20	-	30	50

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

S. No.	Biochemistry I
1.	Preparations of solutions: molar, normal, ppm, percent.
2.	Preparation of buffer.
3.	Qualitative tests for macromolecules (Proteins, Carbohydrates, Lipids)
	a) Proteins-ninhydrin, biuret
	b) Carbohydrates-Molisch's test, Benedict, Iodine,Seliwanoffs ,Barfoed'test
	c) Lipids-solubility tests, Sudan III

4.	Verification of Beer lambert's law using Bromophenol blue and KMnO ₄ .
5.	Protein estimation by Folin Lowry Method
6.	Estimation of total carbohydrates by Anthrone method
7.	Estimation of Reducing sugars by DNS method
8.	Estimation of DNA by DPA method
9.	Estimation of protein by Bradford method
10.	Estimation of RNA by Orcinol Method

i. Text Book and Reference Book:

1. Biochemistry (2015) J.M. Berg, J.L. Tymoczko and L. Stryer, pub. W.H. Freeman.
2. Biochemistry (2011) D. Voet and J.G. Voet, pub. Wiley.
3. Molecular Cell Biology (2012) H. Lodish, et al, pub. W.H. Freeman.
4. Molecular Biology of the Cell (2014) B. Alberts et al., pub. Garland.
5. Practical Skills in Biomolecular Sciences (2012) R. Reed, D. Holmes, J. Weyers and A. Jones, pub. Prentice Hall.
6. Principles and problems in physical chemistry for biochemists (2001) N.C. Price, R.A. Dwek, R.G. Ratcliffe and M.R. Wormald, pub. Oxford University Press.

(3)

a. Course Name: Fundamentals of Microbiology

b. Course Code: 11010102DS02

c. Prerequisite: Basic concept and essential of microbes.

d. Rationale: This syllabus will give the fundamental concept on each topic. Unit cover the basics of microbes, their structure, habitat, growth, essential lab practices and experiment conditions.

e. Course Learning Objective:

CLOBJ 1	Understand the basic concepts of microbial diversity and how the microbe concept emerged
CLOBJ 2	Learn the basic knowledge about microbial growth and microscopy

CLOBJ 3	Identify various microorganisms present in the ecosystem and acquaint with Common equipment used in routine microbiology laboratory
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f. Course Learning Outcomes:

CLO 1	Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes
CLO 2	Learn general characteristics of bacteria, their reproduction & nutritional requirement
CLO 3	Analyze the architecture of viruses, virus classification & their replication strategies.
CLO 4	Identify various culture media and their applications and also evaluate various means of sterilization

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-	0	4	20	20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Unit- 1 Introduction to Microbiology: History of microbiology, Spontaneous generation & non-spontaneous generation. Difference between prokaryotic	25%	15

	and eukaryotic organisms. Endosymbiotic theory. Golden era of microbiology -Contributions of scientists in the field microbiology, Establishment of Koch's postulates. Whittaker's five kingdom of classification, Carl Woese's three kingdom of classification. Prions & Viroid. Scope of microbiology in industries & research. Economic importance of microbes.		
2	Unit -2 Bacteria: General characteristics of eubacteria and archaeobacterial (bacterial cell wall, lipopolysaccharide layer, plasma membrane, cytoplasm, flagella, pili, fimbriae, capsules, slime layer). Bacterial endospores. Difference between endospore cells & vegetative cells. Modes of reproduction in bacteria (transformation, transduction & conjugation), Bacterial nutritional requirement (based on carbon, energy & electron sources).	25%	20
3	Unit- 3 Techniques in Microbiology: Microscopy- light and compound microscopes, staining techniques, culture media, sterilization techniques, disinfectant, sanitization, good laboratory practices for microbiology.	25%	10
4	Unit- 4 Algae, fungi, protozoa and virus: General characteristics of algae, fungi , protozoa and virus. classification of virus on the basis of shape/symmetry, Baltimore system of classification, Bacteriophage, Lytic cycle & lysogenic cycle. Economic importance of algae and fungi	25%	15
Total		100%	60

i. Text Book and Reference Book:

1. Pelczar Jr, M J, Chan E C S, Krieg N R, (1986), *Microbiology: An Application Based Approach*, 5th edn. McGraw-Hill Book Company, NY
2. Ingraham J L and Ingraham C A Introduction to Microbiology: Thomson Brooks/Cole
3. Atlas R M, (2015), Principles of Microbiology 2nd Edition, McGraw Hill education, Mumbai

4. Surinder Kumar, Essentials of Microbiology, JP Medical Ltd, 30-Nov-2015 - Medical - 642 pages
5. Gerard J. Tortora, Berdell R. Funke, Christine L. Case, The Twelfth Edition of Tortora, Funke, and Case's Microbiology: An Introduction
6. Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, Prescott's Microbiology, McGraw-Hill Education, 17-Nov-2019 - Medical - 976 pages.
7. Patricia M. Tille Bailey & Scott's Diagnostic Microbiology.
8. A Textbook of Microbiology by R C Dubey (Author), D K Maheshwari (Author)
9. Microbial Ecology: Organisms, Habitats, Activities, by Heinz Stolp (Author)

(4)

a. Course Name: Lab-2 (Fundamentals of Microbiology)

b. Course Code: 11010102DS04

c. Prerequisite: Basic handling and culturing of microbes.

d. Rationale: This practical curriculum will give the fundamental concept on each topics. Each practical is providing knowledge of importance of sterilization, and media preparation, staining, culturing and growth of different microbes.

e. Course Learning Objective:

CLOBJ 1	Understand the basics of microbiology and biochemistry.
CLOBJ 2	Learn microbial growth and different biochemical pathways used for the same.
CLOBJ 3	Identify the growth of different types of microorganisms based on various environmental factors.

f. Course Learning Outcomes:

CLO 1	Understand the basics of microbiology and biochemistry.
CLO 2	Analyze microbial growth and different biochemical pathways used for the same.
CLO 3	Understand about the growth of different types of microorganisms based on

	various environmental factors.
CLO 4	Identify the basics of microbiology and biochemistry.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	20	-	30	50

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Microbiology Lab
1.	Principle and working of -Microscope, Hot air oven, Autoclave, Laminar Air flow system, water bath, Incubator, Weighing Balance, Micropipette, Hot plate ,Magnetic stirrer
2.	Media preparation -Types of culture media -Nutrient Broth , Nutrient Agar,Potato dextrose Agar, Semisolid media, Mac Conkey's broth and agar
3.	Maintenance of culture media -Techniques (Agar slant, stabs, mineral oil, parafilm)
4.	Preparation of pure culture-Streak plate method
5.	Preparation of pure culture-Pour plate method (Serial dilution)
6.	Preparation of pure culture-Spread plate method (Serial dilution)
7.	Staining techniques -Simple staining(positive and negative),Differential staining, endospore staining, metachromatic staining
8.	Microscopic examination of bread mold
9.	Wet mount of water protozoa
10.	Study of Bacterial growth curve

i. Text Book and Reference Book:

1. Ingraham J L and Ingraham C. A Introduction to Microbiology: Thomson Brooks/Cole.
2. Practical Microbiology by R.C. Dubey and Maheshwari D.K. (Author)
3. Practical Microbiology, 4th Edition | By S. Chand's by Dr. R.C. Dubey (Author), D K Maheshwari (Author).
4. Essentials of Practical Microbiology by Apurba Sankar Sastry and Sandhya Bhat K

5.

a. Course Name: Basic English-II

b. Course Code: 00019302AE04

c. Prerequisite: Basic Knowledge of Communication

d. Rationale: Knowledge of Communication is essential for students

e. Course Learning Objective:

CLOBJ 1	Understand the definition of communication and recognize its significance in various contexts.
CLOBJ 2	Learn the process of communication and its components.
CLOBJ 3	Identify the levels and flow of communication within different organizational structures.
CLOBJ 4	Analyze common barriers to effective communication and develop strategies to overcome them.
CLOBJ 5	Identify non-verbal communication and distinguish between its various forms, including kinesics, proxemics, paralinguistic, and chronemics.
CLOBJ6	Learn error analysis in written and spoken communication, focusing on tense usage, voice variations, and reported speech.

f. Course Learning Outcomes:

CLO 1	Understand communication and articulate its importance in various personal, professional, and societal contexts.
CLO 2	Understand of the process of communication, including its different levels and the flow of information within different communication structures.

CLO 3	Identify barriers to effective communication and apply strategies to overcome these barriers in real-life scenarios.
CLO 4	Analyze error analysis in written and spoken communication, focusing on tense usage, voice variations, and reported speech to identify areas for improvement.
CLO 5	Identify and improve their own communication skills through activities such as reading comprehension, vocabulary building, idioms, phrases, synonyms, antonyms, theatrics (role-play), extempore speaking, application writing, and letter writing, focusing on elements, layouts, inquiries, complaints, and adjustments.
CLO6	Understand effective communication skills, including non-verbal communication techniques such as kinesics, proxemics, paralinguistic, and chronemics, to convey messages accurately and appropriately in various situations.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	-	100	-	-	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

i. Course Content:

Sr. No	Topic	Weightage	Teaching Hrs.
1	1. Definition of Communication & Importance of Communication 2. Definition and process of communication	7%	2
2	1. Levels of Communication 2. Flow of Communication	7%	2
3	1. Barriers to effective Communication 2. Features of effective Communication	7%	2

4	1. Define non-verbal communication 2. Kinesics	3%	1
5	1. Proxemics 2. Paralinguistic 3. Chronemics	3%	1
6	1. Error Analysis (Tenses, voices & reported speech)	7%	2
7	1. Reading Comprehension	3%	1
8	1. Vocabulary Building 2. Idioms 3. Phrases 4. Synonyms 5. Antonyms	7%	2
9	1. Theatrics (Role Play)	16%	5
10	1. Extempore	16%	5
11	1. Application writing	10%	3
12	1. Letter writing (Elements, Layouts, Inquiry, Complain, & Adjustment,)	14%	4
Total		100%	30

j. Text Book and Reference Book:

1. Business Correspondence and Report Writing SHARMA, R. AND MOHAN, K.
2. Communication Skills Kumar S and Lata P; New Delhi Oxford University Press
3. Practical English Usage MICHAEL SWAN
4. A Remedial English Grammar for Foreign Student F.T. WOOD
5. On Writing Well William Zinsser; Harper Paperbacks, 2006; 30th anniversary edition

6. Oxford Practice Grammar, John Eastwood; Oxford University Press
7. Technical Communication: Principles And Practice Sangeetha Sharma, Meenakshi Raman; Oxford University Press

6.

- a. **Course Name:** Mathematical Aptitude
- b. **Course Code:** 00019101SE01
- c. **Prerequisite:** F Basic numeracy skill
- d. **Rationale:** Mathematical aptitude refers to the ability to reason, think critically, and apply mathematical principles to solve problems and make sense of the world around us.
- e. **Course Learning Objective:**

CLOBJ 1	Understand and apply fundamental concepts of arithmetic, including numbers, highest common factor (HCF), lowest common multiple (LCM), square roots, and cube roots, to solve numerical problems efficiently and accurately.
CLOBJ 2	Identify the proficiency in solving problems involving ratio and proportion, including applications in comparison, scaling, mixing, and distribution scenarios, to analyze and solve real-world quantitative problems effectively.
CLOBJ 3	Remember competency in solving problems related to permutations and combinations, including applications in counting arrangements, selections, and probability calculations, to analyze and solve combinatorial problems across various domains.
CLOBJ 4	Analyze the concepts of percentage, average, and partnership, including shortcut techniques for calculating averages and distributing profits or expenses among partners, to analyze financial data and make informed decisions.
CLOBJ 5	Remember the proficiency in solving problems related to time, work, distance, boats, streams, mixtures, logarithms, progressions (arithmetic mean, geometric mean, harmonic mean), and series, to solve practical problems involving time management, resource allocation, and sequence analysis.
CLOBJ 6	Identify the ability to solve problems related to interest (simple interest and compound interest), depreciation rates, profit-loss calculations, discounts,

	equations (linear and quadratic), and probability, to analyze financial transactions, investment decisions, and risk assessment scenarios effectively
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f. Course Learning Outcomes:

CLO 1	Identify and differentiate between numbers, including integers, fractions, decimals, and real numbers.
CLO 2	Analyze data presented in various forms, including tables, charts, and graphs, to extract meaningful information related to percentages, averages, and proportions.
CLO 3	Learn knowledge of logarithms, exponential functions, and interest rates to solve problems related to financial calculations, including compound interest, depreciation, and annuity investments.
CLO 4	Analyze and interpret data sets, including grouped and ungrouped data, to calculate measures of central tendency (mean) and dispersion (standard deviation) and draw meaningful conclusions about data distributions.
CLO 5	Understand and critique data interpretation methods, including the accuracy and effectiveness of tabulation, bar graphs, pie charts, and line charts in conveying information and making comparisons.
CLO 6	Analyze information from multiple sources to solve problems related to mensuration, including calculating areas, perimeters, volumes, and surface areas of geometric shapes and solids.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20		60		100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage%	Teaching Hours
1	Numbers, HCF & LCM, Square Root & Cube Root, Ratio & Proportion, Permutations & Combinations, Percentage, Average-Shortcut averages, Partnership, Time -work & distance, Boats & streams, Mixtures, Logarithm	40%	12
2	Progression (AM, GM, HM), Series, Interest (S.I. & C.I.) and depreciation rate, Profit-Loss & Discount, Equations (Linear & Quadratic), Probability	40%	12
3	Mensuration I (Area & Perimeter), Mensuration II (Volume & Surface area), Grouped Data, Ungrouped Data (Mean and Standard Deviation) Data interpretation: (Tabulation, Bar Graph, Pie Chart, Line Chart).	20%	6
Total		100%	30

- a. **Course Name:** Digital Health
- b. **Course Code:** 19010002UE01
- c. **Prerequisite:** Basic Knowledge of Healthcare Systems, Medical Science, Information Technology Literacy, Healthcare Terminology, Regulatory and Ethical Considerations.
- d. **Rationale:** Emergence of Digital Health Technologies, Data-Driven Decision Making, Interdisciplinary Nature & Improved Patient Outcomes.
- e. **Course Learning Objective:**

CLOBJ 1	Understand the Interdisciplinary Nature of Digital Health: Identify the diverse disciplines and stakeholders involved in digital health, including healthcare providers, technologists, policymakers, researchers, and patients.
CLOBJ 2	Identify the historical development and key milestones in the field of digital health, including the adoption of electronic health records (EHRs), emergence of telemedicine, and advancements in wearable technologies.
CLOBJ 3	Learn the functionalities and significance of health information technologies such as Electronic Health Records (EHRs), Health Information Exchange

	(HIE), and interoperability standards in facilitating data exchange and continuity of care.
CLOBJ 4	Analyze the capabilities and potential applications of wearable technologies and remote monitoring devices in healthcare, including monitoring vital signs, tracking physical activity, and managing chronic conditions.
CLOBJ 5	Identify the effectiveness, scalability, and regulatory considerations of telemedicine and health applications for chronic disease management and remote patient monitoring.
CLOBJ 6	Learn ethical considerations related to data privacy, patient consent, data security, and equity in access to digital health technologies, and their implications for research, development, and implementation.

f. Course Learning Outcomes:

CLO 1	Identify and describe the interdisciplinary nature of digital health, recognizing the contributions of various stakeholders and disciplines such as medicine, technology, policy, and entrepreneurship.
CLO 2	Understand the functionalities and significance of health information technologies, including Electronic Health Records (EHRs), Health Information Exchange (HIE), and interoperability standards, in facilitating data exchange and healthcare delivery.
CLO 3	Analyze the impact of health analytics and big data in healthcare, including their role in improving clinical decision-making, population health management, and personalized medicine.
CLO 4	Remember knowledge of wearable technologies and remote monitoring devices to analyze their potential applications in healthcare, including disease management, preventive care, and patient engagement.
CLO 5	Analyze the future trends and emerging technologies in digital health, including Internet of Things (IoT) applications, block chain in healthcare, and other transformative technologies, in terms of their potential impact, scalability, and ethical considerations..
CLO 6	Understand knowledge of artificial intelligence (AI) and machine learning applications in healthcare to propose innovative solutions for diagnostics,

	treatment optimization, and predictive analytics.
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g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
4	-		4	20	20		60		100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	Foundations of Digital Health Overview of Digital Health Evolution and milestones in Digital Health Interdisciplinary nature of Digital Health Key stakeholders and their roles Health Information Technologies: Electronic Health Records (EHR), Health Information Exchange (HIE), Standards, and Interoperability	25%	15
2	Patient-Centric Technologies Wearable Technologies and Remote Monitoring Telemedicine and telehealth Mobile Health (mHealth) Applications Chronic disease management using mobile technologies Regulatory considerations for mobile health apps	25%	15
3	Data Analytics and Artificial Intelligence in Healthcare Health Analytics and Big Data Role of data analytics in healthcare Big data applications in health Artificial Intelligence in Healthcare Machine learning applications in diagnostics and treatment	25%	15
4	Innovation, Ethics, and Future Trends Digital Health Start-ups and Innovations Case studies of successful digital health	25%	15

	innovations Entrepreneurship in digital health Regulatory and Ethical Considerations Regulatory frameworks for digital health products Ethical considerations in digital health research and development Future Trends and Emerging Technologies Internet of Things (IoT) in healthcare Block chain applications in healthcare Emerging technologies shaping the future of digital health		
Total		100%	30

i. Text Book and Reference Book:

1. Digital Health: A Framework for Healthcare Transformation "By Marion J. Ball, Patricia C. Dykes, and Kathryn H. Bowles | Springer
2. Introduction to Digital Health By Jörg F. Debatin, Nassir Navab, Christoph Seebauer | Springer
3. The Fourth Industrial Revolution By Klaus Schwab | Crown Business
4. Healthcare Information Technology Exam Guide for CompTIA Healthcare IT Technician and HIT Pro Certifications By Kathleen A. McCormick | McGraw-Hill Education
5. Digital Health: Scaling Healthcare to the World By Homero Rivas, Paul Cerrato, and John Mattison | CRC Press

Semester 3

Course Name: Advanced English-I

Course Code: 00019303AE01

Prerequisite: Basic Knowledge of Commercial Communication and provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce. To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives.

Rationale: Advanced Communication Skills of English Language

Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE		T	P	
2	-	-	-	2	100	100		-	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	1.abcd 2.Public Speaking Define Public Speaking Importance of Public speakingTypes of Public speaking techniques to master public speaking	5%	2
2	Activity – Speaking World’s best public speakers (activity based)	10%	5
3	Debate Vs Group Discussion Define Debate vs GD Importance of debate Techniques to master debate	5%	1
4	Activity – Debate	10%	5

5	Vocabulary building Advanced Vocabulary Building Homophones Homonyms Analogies	10%	2
6	Reading Comprehension Reading Comprehension	10%	2
7	Grammar - Error Analysis Para- jumble sentence completion confusable sentences Incorrectly spelt words One word substitute Cloze Passages	10%	5
8	Report Writing Report Writing	10%	2
9	Memo Writing Memo Writing	10%	2
10	Narrative Story Writing Narrative Story Writing	10%	2
11	Activity - Tourism Pitch Activity - Tourism Pitch	10%	2
	Total	100%	30

Text Book and Reference Book:

1. Business Correspondence and Report Writing by SHARMA, R. AND MOHAN, K
2. Communication Skills by Kumar S and Lata P | New Delhi Oxford University Press
3. Practical English Usage by MICHAEL SWAN
4. A Remedial English Grammar for Foreign Student by F.T. WOOD
5. On Writing Well by William Zinsser | Harper Paperbacks, 2006 | 30th anniversary edition
6. Quantitative Aptitude for Competitive Examinations by Dr. R.S. Aggarwal

Course Name: - Basic French-I

Course Code: 00019303AE03

Prerequisite: Knowledge of English Language

Rationale: Basic Communication Skills of French Language.

Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
2	-	-	-	2	100	100	-	-	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of

assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	Grammar Alphabets Numbers Telling time Personal Pronouns Nouns (masculine & feminine nouns, singular and plural nouns) Verbe conjugations (être, avoir, s'appeler and "er ending") Adjective possessive (mon, ma, ton, ta, etc.)	33%	10
2	Listening Skills Sounds French Songs Basic Vocabulary (months of the year, days of the week, family members' names, Countries and nationalities, colors, Professions)	17%	5
3	Speaking Skills How to Introduce self? Greetings How to ask and tell time? How to talk about Family?	17%	5
4	Reading Skills Samples of: Self Introduction My family	33%	10
	Total	100%	30

Text Book and Reference Book:

1. Saison 1 Didier By Marie-Noelle Cocton | Didier
2. Enchanté By Ms. Archana Khurana | Rachna Sagar
3. Larrouse Dictionnaire de Poche

4. Larousse French Grammar (Mini) by Paperback
5. Plaisir D'ecrire By Viral Thakkar | Saraswati House Pvt. Ltd

Course Name: IPDC including History and Culture of India and IKS-II

Course Code: 00019303VA01

Prerequisite: - IPDC Including History and Culture of India and IKS-I

Rationale: IPDC aims to prepare students for the modern challenges they face in their daily lives. Promoting fortitude in the face of failures, Unity amongst family discord, Self-discipline amidst Distractions and many more priceless lessons. The course focuses on morality and character development at the core of student growth, to enable students to become self-aware, sincere, and successful in their many roles - as an ambitious student, reliable employee, caring family member, and considerate citizen.

Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
2	-	-	-	2	100	100	-	-	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	Remaking Yourself: Begin with the End in mind Students will learn to visualize their future goals and will structure their lives through smart goals to give themselves direction and ultimately take them to where they want to go.	6%	2
2	Remaking Yourself: Being Addiction-Free Students will explore the detrimental effects of addictions on one's health, personal life, and family life.	6%	2

	They will learn how to take control of their life by becoming addiction free.		
3	Selfless Service: Case Study: Disaster Relief Students will apply previous lessons of seva, to analyse the case study of the Bhuj earthquake relief work.	6%	2
4	Soft Skills: Teamwork & Harmony Students will learn the six steps of teamwork and harmony that are essential for students' professional and daily life.	6%	2
5	My India My Pride: Present Scenario To implement the transformation of India from a developing country into a developed country it is necessary to have a value-based citizen. Students will see how the transformation to a greater India relies on the vision and efforts of themselves as a youth.	6%	2
6	Learning from Legends: Leading Without Leading Students will explore a new approach to leadership, through humility.	7%	2
7	My India My Pride: An Ideal Citizen – 1 Students will learn that to become value-based citizens, they must first develop good values in their lives. They start by exploring the values of responsibility and integrity.	7%	2
8	My India My Pride: An Ideal Citizen – 2 Students will learn that by developing the values of loyalty, sincerity, and punctuality; they become indispensable and can leave a strong impression. They will start developing these values by trying to keep perfection in every small task and by looking at the bigger picture.	7%	2
9	Facing Failures: Timeless Wisdom for Daily Life Students will learn the role wisdom plays in finding long-term stability. They will use ancient wisdom to solve their modern-day challenges.	7%	2
10	From House to Home: Forgive & Forget Students will understand the importance and benefits that forgiveness plays in their personal and professional life. They will learn to apply this knowledge in realistic situations.	7%	2
11	Remaking Yourself: Stress Management Students will learn to cope with current and future causes of stress.	7%	2
12	Remaking Yourself: Better Health Better Future A healthy body prevents disease and stress; increases positivity, productivity, and brainpower. Students will learn to maintain good health through regular exercise, healthy eating habits, and regular and sufficient sleep.	7%	2
13	Learning from Legends: Words of Wisdom A panel of learned and	7%	2

	experienced mentors will personally answer practical questions that students face in their daily life.		
14	Soft Skills: Financial Planning Students will develop a variety of practical financial skills that prepare them to become financially stable throughout their future careers.	7%	2
15	Remaking Yourself: Impact of Company and Life After IPDC Students will understand that the type of company that we keep, has a crucial role in determining who we are and who we will become. They will develop the ability to create a positive environment around them. This concluding lecture encourages students to keep practicing these priceless lessons and prepares them for the next steps in their lives.	7%	2
	Total	100%	30

Course Name: - Artificial Intelligence

Course Code: 03010503SE01

Prerequisite: - Data structure, Probability and Statistics, Linear Algebra, Mathematics

Rationale: This course provides a broad introduction to Artificial Intelligence. AI techniques for search and knowledge representation also apply knowledge of AI planning and machine learning techniques to real-world problems.

Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme				Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks		External Marks		
					CE	P	T		
2	-	-	-	2	40	-	60		100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	UNIT-1 Introduction to AI and ML concepts Machine Learning algorithms- Supervised Linear Regression, Logistic Regression, Decision Trees, Random Forest, Support Vector Machines (SVM), Naive Bayes, k-Nearest Neighbors (k-NN) Unsupervised K-Means Clustering, Hierarchical Clustering, Density Based Clustering, Anomaly Detection Techniques, Reinforcement Learning	20%	7
2	UNIT-2 Programming fundamentals in Python- Syntax, Variables and Data Types, Operators, Control Structures, Functions, Data Structures, Input and Output, Modules and Packages	20%	6
3	UNIT-3 Data preprocessing and Data analysis Using Python Library (Pandas, Numpy). Data exploration and Visualization Using Python Library (Matplotlib, Seaborn)	20%	7
4	UNIT-4 Model Evaluation- Classification Metrics, Regression Metrics Model Selection- Train-Test Split, Cross-Validation Methods (K-Fold, Random Sampling, Leave-one out, Hold-Out) Ethical considerations in AI and ML	20%	5
5	UNIT-5 Training and evaluating models on real-world datasets (e.g., image classification, text analysis)	20%	5
	Total	100%	30

Text Book and Reference Book:

1. "Artificial Intelligence: A Modern Approach" Author: Stuart Russell and Peter Norvig |Publisher: Pearson (TextBook)

2. "Python Machine Learning" Author: Sebastian Raschka and Vahid Mirjalili | Publisher: Packt
3. "Machine Learning Yearning" Author: Andrew Ng | Publisher: Deeplearning.ai
4. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" Author: Aurélien Géron | Publisher: O'ReillyMedia
5. "Machine Learning: A Probabilistic Perspective" Author: Kevin P. Murphy | Publisher: The MIT Press.

a. Course Name: Molecular Biology

b. Course Code: 11010203DS01

c. Prerequisite: - Basic knowledge of nucleic acid, DNA replication, translation and transcription

d. Rationale: Students will be familiar general concept of molecular biology such as molecular nature of the gene and its mechanisms of gene replication, mutation, transcription and expression.

e. Course Learning Objective:

CLOBJ 1	Analyze after completion of this course, the students shall be able to Learn structural levels of nucleic acids- DNA and RNA and genome organization in prokaryotes and eukaryotes.
CLOBJ 2	Understanding the concept of Gene and the gene architecture.
CLOBJ 3	Remembering of the central dogma of life and various molecular events
CLOBJ 4	Learn molecular events in the DNA replication and role of different enzymes.
CLOBJ 5	Understand the concept of gene in prokaryotes and Eukaryotes
CLOBJ 6	Learn the concept of reverse transcription.

f. Course Learning Outcomes:

CLO 1	Learn the different types of nucleic acids and their significance.
CLO 2	Learn about structural and functional aspects of gene.
CLO 3	Learn about the gene regulation.
CLO 4	Analyse the significant roles of different enzymes in DNA replication.

CLO 5	Understand the relationship between the diverse groups of prokaryotes and eukaryotes.
CLO 6	Identify the overall process of Transcription and translation.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/ Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4	20	20	-	60	-	100

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	UNIT I: DNA structure and replication DNA structure and replication: Nucleosides structure, Structure of DNA, Types of DNA: A, B and Z forms of DNA, Chargaff's rule, DNA as genetic material Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bidirectional replication, DNA polymerases, the replication complex: prepriming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication	25%	15
2	UNIT II: DNA damage and repairing mechanism DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombinational repair, non homologous end joining, Homologous recombination: models and mechanism	20%	12

3	UNIT III: Transcription and RNA processing Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains Structure of RNA: mRNA, tRNA Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, elongation and termination.	30%	18
4	UNIT IV: Genetic code and translation Genetic Code: Deciphering genetic code, properties of genetic code, wobble hypothesis, codon degeneracy Prokaryotic and eukaryotic translation: Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides	25%	15
	Total	100%	60

i. Text Book and Reference Book:

1. Cell and Molecular Biology by Gerald Karp
2. Molecular Biology of the Cell by Bruce Alberts
3. Molecular Cell Biology (2012) by H. Lodish, et al, pub. W.H. Freeman
4. The Cell: A Molecular Approach by Cooper GM
5. Genes VIII By Lewin

Course Name: Intellectual Property

Course Code: 17010103UE01

Prerequisite: Students should have a basic understanding of creative and innovative processes, familiarity with different types of intellectual property (such as copyrights, trademarks, and patents), and awareness of the significance of IP rights in promoting innovation and protecting creators.

Rationale: Studying Intellectual Property (IP) is crucial for students as it helps them understand how IP rights incentivize creativity and innovation, equips them with knowledge to protect their own intellectual contributions, and fosters an appreciation for the legal and economic impacts of IP in various industries.

Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4		20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	PATENT Introduction to Intellectual Property Law (IPR) Meaning of patent Patentable inventions Procedure for obtaining patent Rights of patent holder Infringement and remedies of patent	25%	15
2	COPYRIGHT Introduction, meaning and characteristics of copyright Rights of copyright owner Infringement and remedies of copyright	25%	15
3	TRADEMARK Introduction and meaning of trademark Types of trademarks Procedure for registering trademark Infringement and remedies of trademark	25%	15
4	OTHER IPR Geographical Indications: Overview on Geographical Indication Act Designs: Overview on Design Act, 2000 Semiconductor Integrated Circuits Layout: Overview on Semiconductor Integrated Circuits Layout Design Act, 2000 Plant Varieties and Farmers' Rights:	25%	15

	Overview on Protection of Plant Varieties and Farmers' Rights Act, 2001		
	Total	100%	60

Text Book and Reference Book:

1. Law Relating to Intellectual Property Rights by V K Ahuja | Lexis Nexis
2. Intellectual Property Rights by P. Narayanan | Eastern Law House Private Ltd, Pub. Year 2001
3. The Global Regime for the Enforcement of Intellectual Property Rights by X. Seuba | Cambridge University Press, Pub. Year 2017
4. The Global Regime for the Enforcement of Intellectual Property Rights by X. Seuba | Cambridge University Press, Pub. Year 2017.

a. Course Name: Lab-I Molecular Biology

b. Course Code: 11010203DS03

c. Prerequisite: Basic knowledge of nucleic acid, spectrophotometer and agarose gel electrophoresis

d. Rationale: Students will be familiar basic techniques used in molecular biology such as isolation of nucleic acid and its concentration estimation, agarose gel electrophoresis and PCR techniques.

e. Course Learning Objective:

CLOBJ 1	Analyze after completion of this lab, the students shall be able to experimentally learn structural levels of nucleic acids- DNA and RNA and genome organization in prokaryotes and eukaryotes.
CLOBJ 2	Analyse the structure of DNA and the gene architecture.
CLOBJ 3	Identify the chemical and molecular processes that occur between the cells.
CLOBJ 4	Learn molecular techniques for isolation and quantification of DNA.
CLOBJ 5	Identify the restriction sites and mutagenesis.
CLOBJ 6	Learn the concept of gene cloning through PCR.

f. Course Learning Outcomes:

CLO 1	Learn the different types of nucleic acids and their significance.
CLO 2	Learn about structural and functional aspects of gene.
CLO 3	Analyse about the gene regulation and its functions.
CLO 4	Analyse the techniques in DNA and RNA isolation.
CLO 5	Understand the relationship between the mutation and mutagenic agents.
CLO 6	Identify the overall process of Gene Cloning.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	4	-	2	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

1.	Isolation of genomic DNA from Bacterial
2.	Isolation of genomic DNA from Plant
3.	Estimation of DNA by Diphenylamine and spectrophotometric method
4.	Isolation of RNA from yeast cells
5.	Estimation of RNA by orcinol and spectrophotometric method.
6.	Estimation of DNA and purity determination by UV absorption method
7.	Agarose gel electrophoresis

i. Text Book and Reference Book:

1. Current Protocols in Molecular Biology by Ausbel S.M. and Brent R.
2. Molecular Biology, By Robert Weaver | MCGraw-Hill, 5th Edition, 2012.
3. Molecular Biology of the Cell Author: Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter.
4. Molecular Biology of the Gene by J.D. Watson and H.H. Nancy.
5. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson and John Walker | 6th, Pub. Year 2015.

- a. Course Name:** Lab II – Immunology
- b. Course Code:** 11010203DS04
- c. Prerequisite:** Basic knowledge of buffers, solutions, biomolecules, antigen, antibody etc.
- d. Rationale:** Student would be able to conduct basic Immunology practical
- e. Course Learning Objectives:**

CLOBJ 1	Analyze after completion of this lab, the students shall be able to experimentally learn antigen-antibody reactions.
CLOBJ 2	Identify white blood cells (leucocytes) and their structure.
CLOBJ 3	Identify red blood cells (erythrocytes) and their structure.
CLOBJ 4	Understand the differential Blood cells count.
CLOBJ 5	Learn to detect the Blood grouping reactions.
CLOBJ 6	Learn about the process of Haemoglobin estimation.

- f. Course Learning Outcomes:**

CLO 1	Understand the antigen-antibody reactions.
CLO 2	Identify the structure of white blood cells (leucocytes) and their function.
CLO 3	Identify the structure of red blood cells (erythrocytes) and their function.
CLO 4	Learn the cell count of and representing them in percentage of cells on slide.
CLO 5	Identify the different blood groups and their significance.
CLO 6	Identify the role of Haemoglobin in the person and its related disorders.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	4	-	2	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

1.	To perform whole Count of WBC using Hemocytometer
2.	To perform whole Count of RBC using Hemocytometer
3.	To estimate the concentration of Haemoglobin (Hb) from given blood sample
4.	To conduct Haemeagglutination tests for identification of human blood groups
5.	To perform differential count of Leucocytes from given blood sample
6.	To Detect of HCG by latex agglutination inhibition test.
7.	To Detect Enteric fever by slide agglutination tests.
8.	To Detect Enteric fever by tube test.
9.	To perform Erythrocyte Sedimentation Rate (ESR).
10.	To prepare serum from freshly withdrawn blood

i. Text Book and Reference Book:

1. Practical Immunology by Frank C. Hay and Olwyn M.R. Westwood | Blackwell Science Ltd. 4th
2. Immunology by Roitt I.M., Brostoff. J, Male. D.K. | B. K. & Cdreds, Garland Pub Ltd. | 7th, Pub. Year 2014.

3. Immunology by Goldsby. R.A, Kindt.T.J, Kuby J and Osborne BA | W.H. Freeman Pubn. New York | 7th, Pub. Year 2014.
4. Fundamental Immunology by R.M. Coleman, M.F. Lombard, R.E.Sichard. | Bookbarn International | 5th, Pub. Year 2014.
5. Cellular and Molecular Immunology by Abbas K A, Litchman A. H. | W. B. Saunders Co. | 8th, Pub. Year 2015.

a. **Course Name:** Immunology

b. **Course Code:** 11010203DS02

c. **Prerequisite:** Basic knowledge of cellular molecules

d. **Rationale:** The subjects offer all basic concepts of molecular biology, which will form a base for understanding advanced subjects of applied life sciences further.

e. **Course Learning Objectives:**

CLOBJ 1	Understand after completion of this course, the students shall be able to understand the different types of immune cells.
CLOBJ 2	Identify the function of Immune system in body/s defense.
CLOBJ 3	Understand the mechanism of allergic reactions and hypersensitivity.
CLOBJ 4	Identify the structure of Antibody and their types.
CLOBJ 5	Understand the different types of immunologic techniques.
CLOBJ 6	Learn about auto immune disorders.

f. **Course Learning Outcomes:**

CLO 1	Learn to distinguish between the different types of immune cells.
CLO 2	Understand the role of Immune system in body's defense.
CLO 3	Remember the underlying mechanism of allergic reactions and hypersensitivity.
CLO 4	Identify the types and functions of different Antibodies.
CLO 5	Learn the reactions involved in immunologic techniques.
CLO 6	Identify the different auto immune disorders and their treatment.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/ Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4		20	-	60	-	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

Sr.	Topics	Weightage	Teaching Hours
1	Unit-1 Introduction to Immunology Historical background, biological aspects of Immunology and Scope of Immunology. Antigens: Antigenicity, Immunogenicity, Essential features of Ag, haptens-carrier complex, Antigenic determinants, Adjuvants. Antibodies: Nature, Primary structure of immunoglobulins, light chain, heavy chain, variable region, constant region, Hinge region; Enzymatic fragmentation of Ig. Domain structure of Ig. Classification and Functions of Immunoglobulins: Types –IgG (G1, G2, G3 & G4), IgM, IgA, IgD and IgE	25%	15
2	Unit-2: Components of Immune System Types of Immunity: Active and passive immunity. Cell mediated immunity, humoral immunity, and immune response; primary and secondary response. Phagocytosis, mechanism of phagocytosis. Cells and Organs of Immune system: Nk cells, B cells, T cells, Phagocytic cells, Macrophages, Neutrophils, Basophils, Eosinophils and Dendritic cells, Primary lymphoid organs- Bone marrow and Thymus and secondary lymphoid organs-Lymphatic system, Spleen, Lymph node, CALT and MALT.	25%	15

3	Unit-3: Complement System and Transplantation Complement system: Nature, components and functions of complement, Pathways: Classical, alternative and Lectin pathways. Complement fixation tests. Major Histocompatibility Complex: MHC in mice and HLA in man- fine structure of different types of MHC and functions of each. Transplantation: Terminology, Auto graft, Isograft, Allograft, Xenograft, Immunological basis of transplantation reactions and Allograft rejection.	25%	15
4	Unit-4 Antigen-Antibody Interaction and Immunological Techniques Strength of Antigen- antibody interaction: Antigen antibody interaction, Precipitation curve in liquid, Precipitation reaction in gel- single radial immuno diffusion, Ouchterlony immuno diffusion, Immuno-electrophoresis, Rocket immuno-electrophoresis, 2 D immunoelectrophoresis. Agglutination: Direct and Indirect, Widal test, VDRL test. ABO blood grouping and Rh factor, Types of agglutination- Bacterial, hemagglutination, passive and agglutination inhibition. Immunological techniques: Radioimmunoassay- Principle, method and Application. ELISA – Principle, Methodology and applications. Immunoprecipitation, Immuno-fluorescence: Direct, indirect and Sandwich, in situ localization by techniques such as FISH and GISH.	25%	15
	Total	100%	60

i. Text Book and Reference Book

1. Immunology by Judy Owen, Jenni Punt, Sharon Stranford, Patricia Jones Kuby | W.H. Freeman Pubn | 8th, Pub. Year 2018
2. Immunology by Goldsby. R.A, Kindt. T.J, Kuby J and Osborne BA | W.H. Freeman Pubn. New York | 7th, Pub. Year 2014
3. Fundamental Immunology by R.M. Coleman, M.F. Lombard, R.E. Sitchard. | Bookbarn International | 5th, Pub. Year 2014
Cellular and Molecular Immunology by Abbas K A, Litchman A. H. | W. B. Saunders Co. | 8th,

Semester 4

Course Name: Advance English-II

Course Code: 00019304AE04

Prerequisite: Interpersonal skills along with aptitude skills.

Rationale: The development of soft skills, professional etiquette, effective communication, reading comprehension, and assertiveness is essential for personal and professional growth, as these competencies foster successful interpersonal relationships, enhance workplace dynamics, and empower individuals to navigate complex environments with confidence and clarity.

Course Learning Objective:

CLOBJ 1	Identify and develop soft skills required for personal and professional growth.
CLOBJ 2	Develop professional etiquette & desired behaviour at the workplace
CLOBJ 3	Speak and participate effectively in oral organizational communication
CLOBJ 4	Improve comprehensive skills for reading
CLOBJ 5	Know how to be assertive in professional environment.

Course Learning Outcomes:

CLO 1	Recognise the soft skills and demonstrate to achieve professional growth.
CLO 2	Exemplify and analyze the professional etiquette and work place behaviour
CLO 3	Engage in discussions and presentations applying communication strategies.
CLO 4	Employ reading strategies to understand and evaluate the complex texts.
CLO 5	Practice assertiveness in various communication scenarios.

Mapping of Course Learning Outcomes and Bloom's Taxonomy:

Course Learning Outcomes		Bloom's Level
CLO 1	Recognise the soft skills and demonstrate to achieve professional growth.	2,3

CLO 2	Exemplify and analyze the professional etiquette and work place behavior.	3
CLO 3	Engage in discussions and presentations applying communication strategies.	3,5
CLO 4	Employ reading strategies to understand and evaluate the complex texts.	4,5
CLO 5	Practice assertiveness in various communication scenarios.	2,3

Teaching & Examination Scheme:

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	-	-	100	-	-	-	100

Course Content:

Sr.	Topic	Weightage	Teaching Hrs.
1	Corporate Etiquette: Tips and guide to develop personality and gain various etiquettes manners, case studies and activities. 1) Telephone etiquette	3%	1
2	1) Etiquette for foreign business trips	3%	1
3	1) Etiquette for small talks	3%	1
4	1) Respecting privacy 2) Learning to say 'No'	3%	1
5	1) Presentation	30%	10
6	Email etiquettes & writing	7%	2
7	1) Article writing	7%	2
8	1) Poster making	7%	2
9	Advertisement design	7%	2
10	1) Convincing skills	7%	2
11	1) Insane inventor	7%	2
12	Picture perception	4%	1
13	Book review	4%	1

14	Movie review	4%	1
15	Critical thinking	4%	1
	Total	100%	30 hrs

Reference Books:

1. Business Correspondence and Report Writing SHARMA, R. AND MOHAN, K.
2. Communication Skills
Kumar S and Lata P; New Delhi Oxford University Press
3. Practical English Usage
MICHAEL SWAN
4. A Remedial English Grammar for Foreign Student
F.T. WOOD
5. On Writing Well
William Zinsser; Harper Paperbacks, 2006; 30th anniversary edition
6. Oxford Practice Grammar,
John Eastwood; Oxford University Press

Course Name: Basic French – II

Course Code: 00019304AE03

Prerequisite: Knowledge of MIL – 1 (French) or Basic French – I (00019303AE03)

Rationale: Basic Communication Skills of French Language.

Course Learning Objective:

CLOBJ 1	Talk about future activities and plans.
CLOBJ 2	Ask and respond to questions in French.

CLOBJ 3	Describe feelings in French.
CLOBJ 4	Talk about likes and dislikes.

Course Learning Outcomes:

CLO 1	Learners will be able to recall specific information (e.g., dates, steps, or goals).
CLO 2	Learners will be able to apply knowledge by forming and answering questions in real-life scenarios.
CLO 3	Learners will apply vocabulary and sentence structures to describe their own or others' feelings in French.
CLO 4	Learners will apply vocabulary and sentence structures to share their own preferences effectively.

Mapping of Course Learning Outcomes and Bloom's Taxonomy:

Course Learning Outcomes		Bloom's Level
CLO 1	Learners will be able to recall specific information (e.g., dates, steps, or goals).	1,3

CLO 2	Learners will be able to apply knowledge by forming and answering questions in real-life scenarios.	3
CLO 3	Learners will apply vocabulary and sentence structures to describe their own or others' feelings in French.	2,3
CLO 4	Learners will apply vocabulary and sentence structures to share their own preferences effectively.	1,3

Teaching & Examination Scheme:

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	-	-	100	-	-	-	100

Course Content:

Sr.	Topic	Weightage	Teaching Hrs.
	Grammar: - Articles (definite, indefinite and partitive) - Prepositions (à, en, au, aux, à la, à l', chez, du, de la, des, d')		

1	• Les verbs (Present Tense) : ir, re, irregular verbs • La negation • Le futur Proche • Poser et Répondez aux questions (Asking Questions) – Qui, Quand, Où, Pourquoi, Quel, Quelle, Quels, Quelles, Close-Ended questions	33%	10
2	Listening Skills: • Basic Vocabulary: • Class room objects • Study Subjects • Common nouns of places • Seasons	16%	5
3	Speaking Skills: • Talking to a French Speaking Stranger. • Talking about hobbies. • Talking and writing about hobbies.	18%	5
4	Reading Skills and Writing Skills: • My family • Les dialogues (Talking to a classmate on the 1st day of school/college. / Talking to a friend about your family or vice versa. / Talking and writing	33%	10

	about hobbies. / Talking to a French Speaking Stranger.) • My hobbies • My Best friend		
	Total	100%	30

Reference Books:

- 1. Saison 1 Didier**
- 2. Enchanté 0**
- 3. Larrouse Dictionnaire de Poche**
- 4. Larousse French Grammar (Mini) by Paperback**
- 5. Plaisir D'ecrire by Viral Thakkar, Saraswati House Pvt. Ltd.**

Course Name: Basic German - II

Course Code: 00019304AE02

Prerequisite: (00019303AE02) Basic German - I

Rationale: German is the second most used scientific language. Knowing the language of your German business partners improves your relations and therefore your chances for effective communication and success.

Course Learning Objective:

CLOBJ 1	Communicate, understand various City Places, Body Parts, Professions. Can also able to frame the Sentences with the help of Modal Verbs.
CLOBJ 2	Can communicate in German with Friends and in shopping mall and also able ask and guide Directions in German Language.
CLOBJ 3	Can read basic Passages in German
CLOBJ 4	Write basic topics in German

Course Learning Outcomes:

CLO 1	Recall German vocabulary related to city places, body parts, and professions.
CLO 2	Understand the context of conversations with friends in German
CLO 3	Communicate effectively in German in real-life situations such as shopping or asking for directions.
CLO 4	Analyze German sentence structures to understand the role of modal verbs and contextual clues in passages.

Mapping of Course Learning Outcomes and Bloom's Taxonomy:

Course Learning Outcomes		Bloom's Level
CLO 1	Recall German vocabulary related to city places, body parts, and professions.	1,3
CLO 2	Understand the context of conversations with friends in German	2
CLO 3	Communicate effectively in German in real-life situations such as shopping or asking for directions.	1,3
CLO 4	Analyze German sentence structures to understand the role of modal verbs and contextual clues in passages.	3,4

Teaching & Examination Scheme:

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	-	-	100	-	-	-	100

Course Content	W - Weightage (%)	T - Teaching hours
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Sr	Topics	W	T
.			
1	Grammar and Vocabulary: • Körperteile (Body Parts) • Beruf (Professions) • Konjunktion (Conjunctions) • Modal Verb • Zeitformen (Tenses) • Briefeschreiben (Letter writing)	30%	10
2	Speaking Skills: • Dialogue Sprechen (Suggested Situation) • Richtungen (Asking Directions) • Conversation between two People • Conversation in shopping mall/Shop	30%	6
3	Reading Skills: • Lebenslauf (Daily activities) • Kurzgeschichten (Short stories)	20%	6
4	Listening Skills: • Objekt (Objects) • Audio Übung (audio exercises)	20%	8

	• Conversation identification		
	Total	100 %	30

Reference Books:

Netzwerk A1 Deutsch als Fremdsprache Kursbuch

By Stefanie Dengler, Paul Rusch | Klett- Langenscheidt

Studio D

By Hermann Funk | Cornelsen

The Everything Essential German Book

By Edward Swick | Adams Media

- Course Name: Microbial Physiology and Genetics**
- Course Code: 11010104DS01**
- Prerequisite:** Basic Knowledge of Microbiology and Genetics
- Rationale:** Learning microbial physiology and its genetics aspects.
- Course Learning Objectives:**

CLOBJ 1	Understand after completion of this course, the students shall be able to understand the different types of microbial physiology.
CLOBJ 2	Identify the isolation and identification of microbes.
CLOBJ 3	Understand the mechanism of different modes of nutrition in microbes.
CLOBJ 4	Identify the genome sequences in different kind of microbial biodiversity.

CLOBJ 5	Understand the regulation and biochemical pathway.
CLOBJ 6	Learn about the microbial biomolecules.

f. Course Learning Outcomes:

CLO 1	Understand the different types of microbes and their structure.
CLO 2	Identify the occurrence of microbes in different taxonomic zones..
CLO 3	Identify the various modes of nutrition in microbes.
CLO 4	Analyse the microbial biodiversity on the basis of their genome.
CLO 5	Learn the underlying biochemical process and its mechanism.
CLO 6	Understand different microbial groups and the important biomolecules of the microbes.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h.Course Content:

Sr.	Topics	W	T
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1	Unit-1: Microbial Growth Environments and Nutrition Classification of bacteria on the basis of growth supporting environmental factors such as oxygen, temperature, pH, osmotic pressure, salt, and hydrostatic pressure.Nutritional requirements of Microorganisms. Elementary nutrients: Carbon, Nitrogen, Sulphur, Oxygen and Energy sources, Vitamins and Growth factors. Nutritional categories of microorganisms on the basis of carbon and energysource. Microbial growth in response to nutrition and energy– Autotroph/Phototroph, heterotrophy, Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph, Photoorganoheterotroph. Passive and facilitated diffusion Primary and secondary active transport, concept of uniport, symport and antiport Group translocation.	25	15
2	Unit-2: Microbial Growth Patterns and Sporulation Introduction to growth rate, generation time, Criteria for growth measurement, Cell mass and cell number, cell activity, methods of their measurement, Batch culture, Continuous culture, generation time andspecific growth rate, synchronous growth, diauxic growth curve, Growth Phases, Growth Kinetics. Bacterial Sporulation- Structure of endospore, types of endospores, Endospore formation (Stages) in Bacillus, Spore germination, Significance of Ca-dipicolinate (DPA) and soluble Proteins (SASP).	25	15
3	Unit-3: Microbial Genome Organization and Mutations Genome organization: <i>E. coli</i> , <i>Saccharomyces</i> , <i>Tetrahymena</i> , Plasmid, Mutations and mutagenesis: Definition and types of Mutations; Physical and chemical mutagens; Molecular basis of mutations; Functional mutants (loss and gain of function mutants); Uses of mutations, Reversion and suppression: True revertant; Intra- and inter-genic suppression; Ames test; Mutator genes. Prokaryotic transposable elements – Insertion Sequences, composite and non-composite transposons, Replicative and Non replicative transposition, Mu transposon.	25	15
4	Unit-4: Mechanisms of Genetic Exchange and Gene Regulation in Bacteria Conjugation: Discovery, nature of donor strains and compatibility, interrupted mating and mapping, Hfr, F', map of F plasmid, mechanism of chromosome transfer. Transformation: Natural transformation systems, Biology and mechanism of transformation,	25	15

	Chemical- mediated and electrotransformation. Transduction: Discovery, generalized and specialized or restricted transduction, mechanism of generalized transduction, abortive transduction. Mechanism of specialized transduction. Bacterial gene regulation: Operon structure, Transcriptional activation and repression, Attenuation, Lac, Trp and Ara operon systems, Quorum sensing.		
	Total	100	60

i. Text Book and Reference Book:

1. **Microbiology** By Prescott L, Harley J P and Klein D A
 2. **Microbiology** By Pelczar, Chan Kreig | Tata McGraw Hill
 3. **General Microbiology** By Stanier, R.Y., Adelberg, E.A. and J.I. Ingram
 4. **Biology of micro-organisms** By Madigan M.T., Martinko J.M and Brock J. P | Prentice Hall International, Inc | 8th edition, Pub. Year 1997
- a. **Course Name:** - Lab-I Microbial Physiology and Genetics
 - b. **Course Code:** 11010104DS03
 - c. **Prerequisite:** Basic Knowledge of Microbiology and Genetics
 - d. **Rationale:** Learning microbial physiology and its genetics aspects.
 - e. **Course Learning Objectives**

CLOBJ 1	Understand after completion of this lab, the students shall be able to understand the different types of microbial physiology and its genetics.
CLOBJ 2	Identify the isolation and identification of microbial DNA..
CLOBJ 3	Understand the mechanism of different modes of growth in microbes.
CLOBJ 4	Identify the methods of calculating the growth of bacteria.
CLOBJ 5	Understand the regulation of reproduction in bacteria.
CLOBJ 6	Learn about the microbial biomolecules.

f. Course Learning Outcomes:

CLO 1	Learn the different types of microbial physiology and its genetics.
CLO 2	Analyse the isolation and identification of microbial DNA..
CLO 3	Remember the mechanism of different modes of growth in microbes.
CLO 4	Identify the methods of calculating the growth of bacteria by turbidometric analysis.
CLO 5	Analyse the regulation of reproduction in bacteria via. Conjugation.
CLO 6	Learn about the isolation of micobial biomolecules.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/ Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	4	-	2	-	-	40	-	60	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h.Course Content:

1.	To study the effect of temperature on growth of microorganisms.
2.	To study the effect of pH on growth of microorganisms.
3.	To study the effect of carbon and nitrogen sources on growth of E. coli
4.	To study and plot the growth curve of E. coli by tubidiometric and standard plate count

	methods.
5.	To study the effect of chemical (HNO₂) mutagens on bacterial cells.
6.	To study the effect of UV radiations and Photoreactivation on bacterial cells.
7.	To Demonstrate the Bacterial Conjugation.
8.	To Demonstrate of AMES test.
9.	To Isolate the Plasmid DNA from E. coli.
10.	To perform replica plating technique.

i. Text Book and Reference Book:

- 1. Microbiology** By Prescott L, Harley J P and Klein D A
- 2. Microbiology** By Pelczar, Chan Kreig | Tata McGraw Hill
- 3. General Microbiology** By Stanier, R.Y., Adelberg, E.A. and J.I. Ingram
- 4. Biology of micro-organisms** By Madigan M.T., Martinko J.M and Brock J. P | Prentice Hall International, Inc | 8th edition, Pub. Year 1997

a. Course Name: Bacteriology

b. Course Code: 11010104DS02

c. Prerequisite: Students should have basic knowledge about bacteria and its structure etc

d. Rationale: Understand bacterial systematics and classification

e. Course Learning Objectives:

CLOBJ 1	Understand after completion of this course, the students shall be able to understand the different types of bacteria.
CLOBJ 2	Learn about the difference between gram positive and gram negative bacteria.
CLOBJ 3	Understand the mechanism of different modes of growth in microbes.
CLOBJ 4	Identify the different modes of the nutrition in bacteria.
CLOBJ 5	Understand the different types of reproduction in bacteria.

CLOBJ 6	Learn about the different microbial groups like Archaeobacteria and Eubacteria.
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f. Course Learning Outcomes:

CLO 1	Understand the structure and function of different types of bacteria.
CLO 2	Learn about the cellular and biomolecular difference between gram positive and gram negative bacteria.
CLO 3	Understand the mechanism of different modes of growth in microbes like lag, log and decline phase in bacterial multiplication.
CLO 4	Learn the role of food intake in bacteria with its examples.
CLO 5	Identify the mode of asexual and sexual mode of reproduction in microbial types.
CLO 6	Remember to differentiate between the different microbial groups like Archaeobacteria and Eubacteria.

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4	20	20	-	60	-	100

SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of assignments/Seminars/Presentations/MCQ Tests, etc.)

h. Course Content

Sr.	Topics	Weightage	Teaching Hours
1	Unit-1: Bacterial Systematics Aim and principles of classification of bacteria as per Bergy's manual of systematic bacteriology, concept of species, taxa, strain; conventional, molecular and recent approaches to polyphasic bacterial taxonomy, evolutionary chronometers, rRNA oligonucleotide sequencing, signature sequences, and protein sequences.	25%	15

	Differences between eubacteria and archaeobacteria		
2	Unit-2: Important Eubacteria Groups Eubacteria: Morphology, metabolism, ecological significance and economic importance of following groups: Gram Negative: Non proteobacteria: General characteristics with suitable examples Alpha proteobacteria: General characteristics with suitable examples Beta proteobacteria: General characteristics with suitable examples Gamma proteobacteria: General characteristics with suitable examples Delta proteobacteria: General characteristics with suitable examples Epsilon proteobacteria: General characteristics with suitable examples Zeta proteobacteria: General characteristics with suitable examples Gram Positive: Low G+ C (Firmicutes): General characteristics with suitable examples High G+C (Actinobacteria): General characteristics with suitable examples Cyanobacteria: An Introduction, General characteristics with suitable examples	25%	15
3	Unit-3: Bacterial Nutrition and Microscopy Nutritional requirements in bacteria and nutritional categories; Culture media: components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Electron Microscope.	25%	15
4	Unit-4: Important archaeobacteria Groups Archaeobacteria: General characteristics, phylogenetic overview, genera belonging to Nanoarchaeota (Nanoarchaeum), Crenarchaeota (Sulfolobus, Thermoproteus) and Euryarchaeota [Methanogens (Methanobacterium, Methanocaldococcus), thermophiles (Thermococcus, Pyrococcus, Thermoplasma), and Halophiles (Halobacterium, Halococcus)]	25%	15
	Total	100	60

i. Reference Book:

1. **Microbiology** By Pelczar, Chan Kreig | Tata McGraw Hill
2. **Microbiology** By Prescott L, Harley J P and Klein D A
3. **A Text Book of Microbiology** By R.C Dubey and D. K Maheshwari | S. Chand and Company. |

4. **Microbiology : An introduction** By G.J. Tortora et. Al

5. **General Microbiology** By Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R.

a. **Course Name:** - Lab-II- Bacteriology

b. **Course Code:** 11010104DS04

c. **Prerequisite:** Basic Knowledge of Microbiology and Bacteriology

d. **Rationale:** Learning about bacteria in detail.

e. **Course Learning Objectives:**

CLOBJ 1	Understand after completion of this course, the students shall be able to understand the different types of bacteria culture.
CLOBJ 2	Learn about the difference between gram positive and gram negative bacteria.
CLOBJ 3	Understand the mechanism of different modes of growth in microbes.
CLOBJ 4	Identify the different modes of the nutrition in bacteria.
CLOBJ 5	Understand the different types of reproduction in bacteria.
CLOBJ 6	Learn about the different microbial groups like Archaeobacteria and Eubacteria.

f. **Course Learning Outcomes:**

CLO 1	Understand the morphology of bacterial culture.
CLO 2	Learn differential staining techniques of bacteria.
CLO 3	Analyze the different bacterial growth curve
CLO 4	Understand the nutrient uptake and transport of intermediary metabolites.
CLO 5	Remember the different methods of reproduction in Bacteria.
CLO 6	Evaluate the diifernt types of growth media of bacteria.

g. **Teaching & Examination Scheme:**

Teaching	Examination Scheme	
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Scheme										Total
Lecture Hrs/Week	Tut orial Hrs/ Wee k	Lab Hrs/Wee k	Hrs/ Wee k	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	4	-	2	-	-	40	-	60	100

L- Lectures; T- Tutorial; P- Practical; C- Credit; MSE- Mid-Semester Evaluation, CE- Continuous Evaluation, ESE- End Semester Examination

j. Course Content:

1.	To perform sampling and quantification of microorganisms in air, soil and water.
2.	To prepare different media (Synthetic media BG-11, Complex media-nutrient agar, McConkey agar, EMB agar) and inoculation of culture specific bacteria.
3.	To Observe the Proteobacteria by Bright Field Microscopy
4.	To isolate the actinomycetes from soil.
5.	To perform Acid fast staining
6.	To Identify the biochemical characteristics of any pure culture of bacteria by IMViC tests, catalase test, oxidase test, sugar fermentation and starch hydrolysis test.
7.	To perform the Endospore staining
8.	To isolate the rhizospheric bacteria.
9.	To Demonstrate the anaerobic bacteria cultivation: Robertson's cooked meat media/Use of reduced media.
10.	To perform the staining of Spirochetes.

i. Text Book and Reference Book:

1. **Microbiology** By Prescott L, Harley J P and Klein D A
2. **Microbiology** By Pelczar, Chan Kreig | Tata McGraw Hill
3. **General Microbiology** By Stanier, R.Y., Adelberg, E.A. and J.I. Ingram

4. **Biology of micro-organisms** By Madigan M.T., Martinko J.M and Brock J. P | Prentice Hall International, Inc | 8th edition, Pub. Year 1997

- a. **Course Name:** Biochemical Pathways
- b. **Course Code:** 11010304DS03
- c. **Prerequisite:** Students should have basic knowledge of different biomolecules and their structures.
- d. **Rationale:** Learning biochemical pathways helps to understand metabolism, energy production and nutrition. Dysregulation of biochemical pathways give rise to metabolic disorders. To diagnosis of those diseases and develop therapeutic target, knowledge of these pathways is crucial.

e. Course Learning Objective:

CLOBJ 1	Understand the basic concepts of microbial diversity and how the microbe concept emerged
CLOBJ 2	Learn the basic knowledge about microbial growth and microscopy
CLOBJ 3	Identify various microorganisms present in the ecosystem and acquaint with Common equipment used in routine microbiology laboratory

f. Course Learning Outcomes:

CLO 1	Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes
CLO 2	Learn general characteristics of bacteria, their reproduction & nutritional requirement
CLO 3	Analyze the architecture of viruses, virus classification & their replication strategies.
CLO 4	Identify various culture media and their applications and also evaluate various means of sterilization

g. Teaching & Examination Scheme:

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
4	-	-	-	4	20	20	-	60	-	100

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.	Topics	W	T
1	Unit I- Biochemical Pathways of Carbohydrates Introduction to metabolism and Its types, Overview of cellular respiration. High energy compounds and ATP as energy currency. Glycolysis: Overview, Reactions, Regulations and Energetics. Fates of Pyruvate. TCA cycle: Overview, Reaction, Regulation and Energetics. Components of ETC and oxidative phosphorylation. PPP pathway and Its importance. ED pathway, Glyoxylate cycle, Anaerobic respiration (lactate and ethanol fermentation)	30	18
2	Unit II- Biochemical Pathways of Protein Transamination, Deamination, Decarboxylation of amino acids. Glucose- Alanine Cycle, Urea Cycle: Overview, Reactions, Regulations. Connection of urea cycle with TCA cycle. Glucogenic and Ketogenic Amino Acids. Overview of Creatine metabolism.	30	18
3	Unit III- Biochemical Pathways of Lipid Transport of Lipids: VLDL, LDL, HDL and chylomicrons. β -oxidation: Overview, Reaction, Regulation and Energetics. Ketone bodies formation, Utilization and excretion. Metabolism of Cholesterol: Synthesis, transport, degradation and excretion.	25	14
4	Unit IV- Biochemical Pathways of Nucleic Acid Biosynthesis of Purine and Pyrimidine nucleotides: <i>De Novo</i> and Salvage Pathways, Significance and Regulation. Degradation of Purines and Pyrimidines, RNR, Conversion of ribonucleotides to deoxyribonucleotides,	15	10

		Total	100	60
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i. Text Book and Reference Book:

1. **Campbell Biology. 9th edition**
By Campbell
2. **Biochemistry (2011)**
By D. Voet and J.G. Voet, pub. Wiley
3. **Lehninger Principles of Biochemistry,**
By David L. Nelson, Michael M. Cox, | Publisher: W. H. Freeman | Fourth Edition
4. **Harper's illustrated Biochemistry (TextBook)**
By Robert K. Murray