Kashi Institute of Technology, Varanasi

(An Autonomous Institute of Dr. A.P.J. Abdul Kalam Technical University, Lucknow)

Evaluation Scheme & Syllabus

For

B.Tech. First Year

- **Biotechnology**

(Effective from Session: 2024-25)

MS 23KM, Varanasi – Prayagraj (Allahabad) Highway, Mirzamurad, Varanasi

Uttar Pradesh - 221307

B.Tech. First Year, Semester-I

(Biotechnology)

S.N.	Course Category	Course Code	Course Title	Type	L	T	P	FA	SA	Total	Credit
					Periods						
1	BSC	BSC105	MATHEMATICS FOR BIOTECHNOLOGY-I	T	3	1	0	70	30	100	4
2	BSC	BSC103	BASICS OF COMPUTER	T	3	1	0	70	30	100	4
3	PCC-BT	PCCBT101	FUNDAMENTALS OF BIOLOGY AND BIOTECHNOLOGY	T	3	1	0	70	30	100	4
4	HSMC	HSMC105	SOFT SKILL	T	3	0	0	70	30	100	3
5	HSMC	HSMC155	LANGUAGE LAB	T	0	0	2	70	30	100	1
6	BSC	BSC153	BASIC COMPUTER LAB	T	0	0	2	70	30	100	1
7	PCC-BT	PCCBT151	BASIC BIOLOGY AND BIOTECHNOLOGY LAB	L	0	0	2	70	30	100	1
8	ESC	ESC153	ENGINEERING DRAWING LAB	L	0	0	2	70	30	100	1
9	CCA	CCA151	CO-CURRICULAR ACTIVITIES	-	-	-	-	-	-	100	0.5
10	MC	MCGP101	General Proficiency	-	0	0	0	-	-	100	0.5
Total				**-**	**12**	**3**	**8**	**560**	**240**	**1000**	**20**

Evaluation Scheme header spans Type, Periods (L, T, P), FA, SA, Total, Credit

B.Tech. First Year, Semester-II

(Biotechnology)

SN	Course Category	Course Code	Course Title	Type	L	T	P	FA	SA	Total	Credit
1	BSC	BSC106	MATHEMATICS FOR BIOTECHNOLOGY-II	T	3	1	0	70	30	100	4
2	ESC	ESC102	PROGRAMING IN C	T	3	1	0	70	30	100	4
3	PCC-BT	PCCBT102	INTRODUCTION TO BIOMEDICAL INFORMATICS	T	3	1	0	70	30	100	4
4	HSMC	HSMC106	CAREER DEVELOPMENT COMMUNICATION	T	3	0	0	70	30	100	2
5	BSC	BSC152	ANALYTICAL CHEMISTRY LAB	P	0	0	4	70	30	100	2
6	ESC	ESC152	PROGRAMING IN C- LAB	P	0	0	2	70	30	100	1
7	PCC-BT	PCCBT152	BIOMEDICAL INFORMATICS LAB	P	0	0	2	70	30	100	1
8	ESC	ESC156	WORKSHOP LAB	P	0	0	2	70	30	100	1
9	CCA	CCA152	CO-CURRICULAR ACTIVITIES	-	-	-	-	-	-	100	0.5
10	MC	MCGP102	GENERAL PROFICIENCY	-	0	0	0	-	-	100	0.5
Total				**-**	**12**	**3**	**10**	**560**	**240**	**1000**	**20**

Abbreviation Used:

BT: Biotechnology

PCC: Professional Core Courses

HSMC: Humanities, Social Science and Management Course

MOOC: Massive Open Online Course

CCA: Co-Curricular Activities

MC: Mandatory Courses

ESC: Engineering Science Courses

BSC: Basic Science Courses

DETAILED SYLLABI
B.Tech 1St Year

- Biotechnology

(Effective from Session: 2024-25)

Department : Biotechnology					
Semester : I			**Course Category Code : BSC**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
BSC105	**Mathematics for Biotechnology-I**		**3**	**1**	**0**	**4**

Prerequisite	*At the end of this course, the students will be able to:*		**Bloom's Level**
Course Outcome	**CO1**	*Illustrate the concept of equation and apply for solving quadratic equations and systems of linear inequality in two variables.*	K3
	CO2	*Apply the concept of arithmetic, and geometric progressions for finding the sum to n terms and infinite number of terms.*	K3
	CO3	*Remember the concept of coordinate system and apply for finding distance of a point from a line and conics.*	K1 & K3
	CO4	*Understand the concept of differentiation and apply for finding rate of change, slope.*	K2 & K3
	CO5	*Remember the concept of differentiation and apply for finding the derivative of different types of functions and maxima and minima.*	K1 & K3

UNIT - I	**Algebra**	**Contact Hours : 08**
Fundamental Theorem of Algebra (without proof), solution of quadratic equations. Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of the system of linear inequalities in two variables-graphically.		**CO1**
UNIT – II	**Arithmetic progression and Geometric Progression**	**Contact Hours : 08**
Arithmetic progression (A.P.), general term of A.P., sum of a series in A.P., arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., sum of infinite terms in G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series n, n2 and n3 in A.P.		**CO2**
UNIT – III	**Coordinate Geometry**	**Contact Hours : 08**
Straight Lines: Introduction, Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope- intercept form, two point form, intercepts form and normal form. General equation of a line. Distance of a point from a line, with numerical examples. **Conic Sections:** Sections of a cone: circle, ellipse, parabola, hyperbola and pair of intersecting lines. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle, with numerical examples		**CO3**
UNIT – IV	**Calculus-I**	**Contact Hours : 08**
Introduction, Definition of limit, continuity and differentiability, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric function, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, exponential, logarithmic and parametric forms. Logarithmic differentiation. Derivative introduced as rate of change both as that of distance function and geometrically.		**CO4**
UNIT - V	**Calculus-II**	**Contact Hours : 08**

Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations illustrated examples. Applications of Derivatives: Applications of derivatives: rate of change, increasing/decreasing functions, tangents & normals, approximation and errors, maxima and minima of one variable. Simple problems (that illustrate basic principles and understanding of the subject as well as real- life situations).	**CO5**

Lecture Hours : 03	Tutorial Hours: 01	Total : 04

Reference Books

Text Book:

- *B.V. Rammana: Higher engineering mathematics (Tata Macgraw Hill)*
- *Glynjames : Advanced modern engineering mathematics (Pearson education)*
- *Mathematics - Textbook for Class XI, NCERT Publication*
- *Mathematics Part I - Textbook for Class XII, NCERT Publication*
- *Mathematics Part II - Textbook for Class XII, NCERT Publication*

Video Links:

Unit-1
https://youtu.be/jLP5Xs8Z8yE?si=Nk9ZxUcOZ6YP-lkU
https://youtu.be/Pgft33DBmUs?si=t0Ah50E49fnY4ZRn
Unit-2
https://youtu.be/1Cl2Pje4noo?si=8ZdDhtllyQowAjYS
https://youtu.be/gx7NQXl4NC0?si=ZgAIWJcyKpBKFqQW
Unit-3
https://youtu.be/AS1UnsPJ8e4?si=PlnSp-IaGrS1c2fC
https://youtu.be/8T7Y_nl8yF8?si=j6_Kz3gAuQwKLbMP
Unit-4
https://youtu.be/dLqKr9F2cbA?si=KgpQby-ipVsT29Lr
https://youtu.be/TccLmZ0GW7g?si=HNIhnsHJWyYi_suM
Unit-5
https://youtu.be/AGX0-tZ5rgQ?si=xoSLJ9A3Le5hayFo
https://youtu.be/WwY50hCSiSc?si=QEJuQXgwssa3VWjO

Department : Biotechnology					
Semester : I			**Course Category Code : BSC**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
BSC103	**Basics of Computer**		3	1	0	4
Prerequisite	*At the end of this course, the students will be able to:-*				**Bloom's Level**
Course Outcome	**CO1**	*Identify computer hardware and software.*			K2
	CO2	*Understand the data representation in computers.*			K3, K2
	CO3	*Basic knowledge of computer system and its working.*			K1
	CO4	*Basic knowledge of logical thinking and problem solving.*			K2
UNIT – I					**Contact Hours : 8**
What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.					**CO1**
UNIT – II					**Contact Hours : 8**
What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.					**CO2**
UNIT – III					**Contact Hours : 8**
Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting, World Wide Web; Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance website.					**CO3**
UNIT – IV					**Contact Hours : 8**
Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.					**CO3,CO4**
UNIT - V					**Contact Hours : 8**
Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.					**CO4**
Lecture Hours : 30		**Tutorial Hours:10**			**Total : 40**
Reference Books					
1. *Computer Fundamentals by P K Sinha ,publish by BPB publication in 2022.* 2. *BASIC COMPUTER COURSE by Saumya Ranjan behara ,publish by Vasan publications in 2019.*					

Department : Biotechnology					
Semester : I			**Course Category Code : PCC-BT**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
PCCBT101	**Fundamentals of Biology and Biotechnology**		**3**	**1**	**0**	**4**
Prerequisite	*At the end of this course, the students will be able to:-*				**Bloom's Level**
Course Outcome	**CO1**	*Explain the basic concept of evolution and, cell and genetics*			K1
	CO2	*To understand the human physiology*			K2
	CO3	*To understand the plant physiology*			K1 & K3
	CO4	*To understand about basic knowledge of environment and related issues*			K2 & K3
	CO5	*To introduce about field of biotechnology, its application and scope*			K1 & K3

UNIT - I	**Elementary Biology**	**Contact Hours : 08**
Elementary biology: Origin of life: Oparin theory; Evolution: Lamarckism and Darwinism; Cell biology: prokaryotic and eukaryotic cell, Tissue; Genetics: Mendel's law, extension of Mendel's law, Gene flow and genetic drift; Hardy-Weinberg's principle		**CO1**
UNIT – II	**Human Physiology**	**Contact Hours : 08**
Human physiology: Neural control and coordination, chemical coordination, respiration, blood circulation, reproduction, digestion, excretion.		**CO2**
UNIT – III	**Plant Physiology**	**Contact Hours : 08**
Plant physiology: Photosynthesis-C_3, C_4 and CAM pathway, photorespiration, plant hormones, plant growth and development, nutrition, introduction to stress tolerance mechanism of plants.		**CO3**
UNIT – IV	**Environmental Biology**	**Contact Hours : 08**
Environmental biology: Environment, ecosystem, natural resources, pollution, current environmental issues-global warming and climate change, acid rain, ozone depletion, smog, solid waste management		**CO4**
UNIT - V	**Biotechnology**	**Contact Hours : 08**
Biotechnology: Definition and history, introduction to genetic engineering, transgenic plants, transgenic animals, biotechnology in medicines, single cell protein, AI in biotechnology		**CO5**

Lecture Hours : 30	**Tutorial Hours: 10**	**Total : 40**

Reference Books
• *Organic Evolution (Evolutionary Biology) by Veer BalaRastogi, 15th edition, MedTech science press.*

Reference Books

- *Organic Evolution (Evolutionary Biology) by Veer BalaRastogi, 15th edition, MedTech science press.*
- *Principle of genetics by Gardner, Simmons, Snustad, 8th edition, Wiley publisher, USA.*
- *Guyton and Hall Textbook of Medical Physiology by John E. Hall and Michael E. Hall, 14th edition, Elsevier, USA.*
- *Plant physiology by Lincoln Taiz and Eduardo Zeiger, 5th edition, Sinauer Associates Inc., Publishers Sunderland, Massachusetts USA.*
- *Ecology and environment by PD Sharma, 13th edition, Rastogi publications.*
- *Biotechnology by U Satyanarayana and U Chakrapani, 15th edition*

Text Book:

1. *Trueman's Elementary Biology by K.N. Bhatia and M.P. Tyagi, Vol. 1 For Class 11 Trueman publication*
2. *Trueman's Elementary Biology by K.N. Bhatia and M.P. Tyagi, Vol. 2 For Class 12 Trueman publication*
3. *Cytology Genetics and Evolution by PK Gupta Rastogi Publication*
4. *A Textbook Of Biotechnology by RC Dubey S. Chand publication*

Video Link:

Unit-1
https://youtube.com/playlist?list=PLwdnzlV3ogoXUI3u0VcvFEJ6ZQxjua3R3&si=wwfjctmyDh2Nwq_R
Unit-2
https://www.youtube.com/live/KiIgdkAmbbQ?si=G9zYfjnv13kU7XE3
Unit-3
https://youtu.be/1OA-jMCboEw?si=Qie9KX_82n15ReDL
Unit-4
https://www.youtube.com/live/AskQusSlv-U?si=gfO_nJAZQs8pKOP0
Unit-5
https://youtu.be/KieHRppBIXE?si=o6fQ_1ClQXjv0-zP

Department- Biotechnology					
Semester : I				**Course Category Code: HSMC**	
Course Code	**Course**	**Period/Week**			**Credit**
		L	**T**	**P**	**C**
HSMC105	**Soft Skill**	**3**	**0**	**0**	**3**
Prerequisite	*After completion of course students are able to -*				**Bloom's Level**
Course Outcome	**CO1**	*Introduce, converse, show interest, Respond.*			K1
	CO2	*Improve decisions through practical exercises, cases.*			K2
	CO3	*Telephone etiquette, instructions, job discussions, debates.*			K3
	CO4	*Present, write effectively and Give feedback.*			K2& K3
	CO5	*Build leadership, organize and Prepare proposals.*			K1& K4
UNIT-1	**Interactions Level I**				**Contact Hours:6**
Introducing/Meeting New People ,Giving Self Introduction ,Discussing Interests and Small Talks, Talking about Experiences ,Interview Skills					**CO1**
UNIT-2	**Interactions Level II**				**Contact Hours :6**
Mock Interview Practice ,Soft Skills and Hard Skills, Polite Conversation, Showing Interest, Apologizing					**CO2**
UNIT-3	**Interactions Level III**				**Contact Hours :6**
Relationship Building- Article Reading, Talking about Job, Formal Discussion Attending Meeting, Letter Writing, and Email Writing, and Giving Advice.					**CO3**
UNIT-4	**Interactions Level IV**				**Contact Hours :6**
Attending Meeting, Letter Writing, Email Writing, Resume/CV Writing, Texting Messages and giving feedback, Group Discussion Etiquettes, Group Discussion-Practice.					**CO4**
UNIT-5	**Interactions Level V**				**Contact Hours :6**
Giving Presentation, Telephonic Etiquettes and Practice Agreeing and Disagreeing, Exhibiting Ideas Persuading others, Debate Etiquette, Debate Practice					**CO5**
Lecture Hours: 30		**Tutorial Hours :00**			**Total :30**

Reference Books

1. How to Win Friends and Influence People by Dale Carnegie Simon and Schuster, 1936.
2. The Art of Communication by K.C. Verma, Author House, 2011.
3. Business Communication by M. Raman, Oxford University Press.
4. S.Ravindranathan, R. Perumalsamy,S. Shanmugiah, English for Effective Oral Communication. Cambridge University Press, 2015.

Text Book:

1. Soft skills by Dr.K.Alex, S.Chand & Company Ltd.,New Delhi,2009.
2. Effective Technical Communication by Dr. Bharti Kukreja and Dr. Anupama Jain, S.K. Kataria & Sons, New Delhi.
3.Communication Skills-I by Archana Sharma, Dr Ombir Singh and Dr.Gyaneshwar Pratap Singh, Asian Publishers Muzaffarnagar, 2018.

Video Content:

1. *https://www.youtube.com/watch?v=7OQHte1Eifc&list=PL8nHpqzOrbFB6X0NuSUGX495zN4SzBcd6*

Department : Biotechnology					
Semester: I			**Course Category Code : HSMC**		
Course Code	**Course**	**Period/Week**			**Credit**
		L	**T**	**P**	**C**
HSMC155	**Language Lab**	0	0	2	1
Prerequisite					
Course Outcome	**CO1**	*Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.*			
	CO2	*Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms.*			
	CO3	*Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication.*			
	CO4	*Students will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.*			
	CO5	*Develop and enhance public speaking and presentation skills tailored to a startup environment.*			
List of Practical					

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.

2.Conversational Skills for Interviews under suitable Professional Communication Lab

3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic.

4. Presentation Skills for Technical Paper/Project Reports/ proposals based on proper Stress and Intonation Mechanics.

5. Official/Public Speaking practice sessions based on suitable Rhythmic Patterns.

6. Theme Presentation/ Keynote Presentation based on correct methodologies of argumentation.

7. Individual Speech Delivery/Conferencing with skills to defend Interjections/Quizzes.

8. Argumentative Skills/Role Play Presentation with Stress and Intonation.

9. Comprehension Skills based on Reading and Listening Practical's on a model Audio.

10. Startup presentations, Video portfolio, Extempore, Role play, Just a Minute (JAM) etc.

Department : Biotechnology					
Semester: I				**Course Category Code : BSC**	
Course Code	**Course**	**Period/Week**			**Credit**
		L	**T**	**P**	**C**
BSC153	**Basic Computer Lab**	0	0	2	1
Prerequisite	-				
Course Outcome	**CO1**	*Getting the skills and work effectively on computer application.*			
	CO2	*Able to work on office automation tools and can generate report easily.*			
	CO3	*Understand the concept of internet and use of internet effectively.*			
	CO4	*Analyze the Fundamental of DOS and Linux operating system.*			
	CO5	*Understand basics of various OS related concepts, from programmer's point of view, like files, directories, kernel, inodes, APIs, system calls, processes, signals, etc.*			
List of Practical					
1. Working with computer system and identifying peripherals.					**CO1**
2. Working with files and folders.					
3. Create, Edit and Save Documents.					
4. Use of Bullets, Numbering, Page Formatting in a Word Processing.					
5. Use of Image and Save					**CO2**
6. Tables in Documents					
7. Documents Page Layout					
8. Use of mail merge					
9. Create, Open and Edit worksheet.					**CO1**
10. Working with Formula and Functions in Worksheet.					
11. Sort, Filter and Validate Data					
12. Charts for Visual Presentation					
13. Worksheet Printing					**CO3**
14. Slide Presentation					
15. Slide Presentation Using Tables and Charts					
16. Animation Effects to Text and Slides					
17. Audio and Video Files Presentation					**CO2**
18. Configuration of Internet Connection					

Department : Biotechnology					
Semester : I				**Course Category Code : PCC-BT**	
Course Code	**Course**		**Period / Week**		**Credit**
		L	**T**	**P**	**C**
PCCBT151	**Basic biology and biotechnology lab**	**0**	**0**	**2**	**1**
Prerequisite	*At the end of the course, students will be able to*				**Bloom's Level**
Course Outcome	**CO1**	*Understanding of Importance of safety and Measurements of chemicals*			K2
	CO2	*Understanding of solution preparation and handling of equipments*			K1 & K3
	CO3	*Understanding the difference between cellular types and cell division*			K2 & K3
	CO4	*Understanding of Genetics and related issues*			K1 & K3
	CO5	*Understanding of Bioinformatics*			K2
List of Experiments					
1	Introduction to safety measures in Laboratories				
2	Calculation accuracy				
3	Preparation of solutions and buffers				
4	Equipment handling and pipetting				
5	Study of structure of any Prokaryotic and Eukaryotic cell.				
6	Cell division in onion root tip.				
7	Genetics problems based on: Mendel's law.				
8	Genetics problems based on Hardy-Weinberg's principle.				
9	Introduction to NCBI				
10	Introduction to bioinformatics tools.				

Video Links:

1. *https://youtu.be/wHUYECLMc60?si=Tkaa93OZNU0l4oA6*

2. *https://youtu.be/Qy0Q_AYs63Y?si=b_cFeWEiUwZ-csbk*

3. *https://youtu.be/uO53zq9DBIg?si=NquqHOT_xTRZHeh6*

4. *https://www.youtube.com/live/n74vlqLQs3E?si=ll4PqAjT-702aEMq*

5. *https://www.youtube.com/live/FvXDowpWUaE?si=7wUD9jvYJx_5noHb*

6. *https://www.youtube.com/live/-9Vkzy5PcrE?si=wuJKOl0-zskiesom*

Department : Biotechnology					
Semester : I				**Course Category Code : ESC**	
Course Code		**Course**	**Period / Week**		**Credit**
			L	**T**	**P**	**C**

Course Code		**Course**	**L**	**T**	**P**	**C**
ESC153		**Engineering Drawing Lab**	0	0	2	1
Prerequisite						**Bloom's Level**
Course Outcome	**CO1**	*Use scales and draw projections of objects*				K3
	CO2	*Explain views of solids and their sectional surfaces.*				K2
	CO3	*Analyze and draw isometric projections of objects.*				K2
	CO4	*Demonstrate orthographic representation of perspective views using modern tools.*				K2
	CO5	*Apply AutoCAD software for creation of engineering drawing and models*				K2

UNIT - I		**Contact Hours : 08**
Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales. Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.		**CO1**
UNIT – II		**Contact Hours : 08**
Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.		**CO2**
UNIT – III		**Contact Hours : 08**
Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.		**CO3**
UNIT – IV		**Contact Hours : 08**
Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Perspective Projection: Orthographic representation of perspective views — Plane figures and simple solids, Conversion of pictorial view in to orthographic Projection.		**CO4**
UNIT – V		**Contact Hours : 08**
Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc. Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD.		**CO5**

Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.

2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication

Department : Biotechnology					
Semester : II			**Course Category Code : BSC**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
BSC106	**Mathematics for Biotechnology-II**		**3**	**1**	**0**	**4**

Prerequisite	*The objective of this course is to familiarize the Bio-Technological engineers with techniques in multivariate integrals, linear Differential Equations, vector calculus, three – dimensional geometry and probability. It aims to equip the students to deal with advanced levels of mathematics and applications that would be essential for their disciplines*	**Bloom's Level**
Course Outcome	**CO1**	*Apply the concept of integration to evaluate integrals and apply for finding definite integrals.*	K3
	CO2	*Understand the concept of differentiation and apply for finding the solution of differential equations.*	K3
	CO3	*Understand the concept of vector and apply for finding direction cosines, projection of vector on a line.*	K1 & K3
	CO4	*Apply the concept of three dimensional geometry to find the shortest distance between two lines. Also apply for finding coplanar lines and Cartesian equation of a line*	K2 & K3
	CO5	*Apply the probability to evaluate addition, multiplication and conditional law of probability*	K1 & K3

UNIT - I	**Integrals**	**Contact Hours : 08**
Integrals: Integration of functions by substitution, partial fractions and by parts, only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals. Applications of the Integrals: Applications in finding the area between simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only)		**CO1**

UNIT – II	**Differential Equations**	**Contact Hours : 08**
Differential Equations: Definition, order and degree, general and particular solutions of a differential equation Formation of differential equations whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type: $Dy + py = q$, where p and q are functions of x.		**CO2**

UNIT – III	**Vector Algebra**	**Contact Hours : 08**
Vector Algebra: Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product		**CO3**

UNIT – IV	Three Dimensional Geometry	Contact Hours : 08
Three Dimensional Geometry Three – dimensional Geometry: Direction cosines / ratios of a line joining two points. Cartesian equation of a line, coplanar lines, shortest distance between two lines. Cartesian equation of a plane, Angle between (a) two lines (b) two planes and (c) a line and a plane. Distance of a point from a plane		**CO4**
UNIT - V	Probability	Contact Hours : 08
Exhaustive events , Random experiments , trial and events, Equally likely events, independent events, mutually exclusive events, compound events, favorable events, definition of probability, Axioms of probability, Addition theorem of probability with examples, Multiplication theorem of probability with illustrated examples. Conditional probability. Bayes theorem with examples		**CO5**

Lecture Hours : 03	Tutorial Hours: 01	Total : 04

Reference Books:

1. B.V. Ramana: Higher engineering mathematics (Tata Macgraw Hill)

2. Glynjames :Advanced modern engineering mathematics (Pearson education)

Text Book:
   1. Mathematics - Textbook for Class XI, NCERT Publication
   2. Mathematics Part I - Textbook for Class XII, NCERT Publication
   3. Mathematics Part II - Textbook for Class XII, NCERT Publication

Department : Biotechnology					
Semester : II			**Course Category Code : ESC**		
Course Code	**Course**		**Period / Week**		**Credit**
		L	**T**	**P**	**C**
ESC102	**Programming in C**	**3**	**1**	**0**	**4**
Prerequisite	*At the end of this course, the students will be able to:*				**Bloom's Level**
Course Outcome	**CO1**	*Understood the phases of problem solving techniques for simple problems.*			K_2, K_3
	CO2	*Able to write programs using the basic language constructs.*			K_3
	CO3	*Able to build a larger programs using function oriented approaches.*			K_3
	CO4	*Could write efficient programs using advanced concepts to optimize the memory.*			K_2
	CO5	*Could write programs to access data from the secondary storage efficiently.*			K_2, K_3
UNIT – I	**Algorithm Problem Solving**				**Contact Hours : 8**
History and Classifications of Computers – Components of Computer – Working Principle of Computer – Hardware – Software and its Types – Applications of Computers. Generations of Programming Languages – Introduction to Number System. Problem solving techniques: Program development life-cycle – Algorithms – building blocks of algorithms - Algorithmic problem solving-Flowchart– Pseudo code					**CO1**
UNIT – II	**Data, Expressions, Statements**				**Contact Hours : 8**
Introduction to C –C Program Structure – C Tokens: Keyword, Identifiers, Constants, Variables and Data types (simple and user-defined) – Operators and its types – Operator Precedence – Expression Evaluation – Type Conversion –Managing Input/output operations-Branching Statements – Looping Statements.					**CO2**
UNIT – III	**Arrays and Functions**				**Contact Hours : 8**
Arrays – Two dimensional arrays, Multidimensional arrays. Character arrays.Functions: Function Prototype, Passing Arguments to Function – Call by Value and Call by Reference – Nested function call – Library Functions – User-defined Functions – Recursion.Strings – String I/O functions, String Library functions – Storage classes.					**CO3**
UNIT – IV	**Structures, Unions and Pointers**				**Contact Hours : 8**
Structures – Arrays and structures – Nested structures – Structure as argument to functions–Union. Pointers – Declaration, Initialization and Accessing Pointer variable – Pointers and arrays – pointers as argument and return value – Pointers and strings - Pointers and structures.					**CO4**
UNIT – V	**File Management**				**Contact Hours : 8**
Introduction to File Concepts in C – File types – I/O operations on files – File modes – Random access to files – Command line arguments. Dynamic Memory Allocation: MALLOC, CALLOC, FREE, REALLOC. Introduction to preprocessor: Macro substitution directives – File inclusion directives –Compiler Control directives – Miscellaneous directives					**CO5**
Lecture Hours : 30		**Tutorials Hours: 10**			**Total : 40**

Reference Books :
1. *Byron Gottfried & Jitender Chhabra, "Programming with C", Schaum's Outlines Series, 2017.*
2. *Brian W. Kernighan & Dennis Ritchie. "The C Programming Language", Pearson Education India.*
Text Book:
1. *Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Seventh Edition, 2017.*
Video Links:
1. *https://youtu.be/irqbmMNs2Bo?si=d9HO8clLvVLuxDxd*
2. *https://youtu.be/si-KFFOW2gw?si=Zf3V8klsbEoE_1Rn*
3. *https://youtu.be/rLf3jnHxSmU?si=QqZoZo96sF34DwQ8*

Department: Biotechnology					
Semester : II			**Course Category Code : PCC-BT**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
PCCBT102	**Introduction to Biomedical Informatics**		3	1	0	4
Prerequisite	*At the end of this course, the students will be able to:*				**Bloom's Level**
Course Outcome	**CO1**	*Understand the concept of health information and functions.*			K_2,
	CO2	*Understand and apply the concept of health information types and retrieval.*			K_1,
	CO3	*Understand data and sampling and apply it in biomedical decision making.*			K_3, K_5
	CO4	*Understand the concept and principle of translational research and drug discovery process.*			K_1, K_4
	CO5	*Understanding the concept of clinical research and trials and regulatory issues.*			K_3, K_4,

UNIT – I	**Healthcare & Informatics**	**Contact Hours : 08**
Healthcare functions and information technology, Key Players in Health Information technology (HIT), Organizations involved with HIT, Public Health Informatics - Information systems in public health – National Health Information Infrastructure (NHII). Internet based consumer health information – tele health and telemedicine.		**CO1**

UNIT – II	**Health Information Retrieval**	**Contact Hours : 08**
Electronic health records (EHR), Information Retrieval from Digital Libraries, Imaging Systems in Radiology and Picture archiving. Genomics and Proteomics data - Human Genome project, HapMap and 1000 genomes projects, Genetic profiling of individuals and large populations.		**CO2**

UNIT – III	**Data collection and Visualization**	**Contact Hours : 08**
General approaches to assuring appropriate use of data, data tracking and deidentifying data. Methods and Evaluation in biomedical decision making: Sampling, appropriate use of controls, data collection, testing of statistical significance, sensitivity and specificity, ROC plots. Ethics, legal and regulatory matters in health informatics.		**CO3**

UNIT – IV	**Translational research**	**Contact Hours : 08**
Translational Research - Concepts and Principles. Therapeutic discovery in an academic setting, Bringing drugs from bench to bedside for cancer therapy - Molecular basis of cancer, strategies for developing therapeutic treatments, how imatinib and dasatinib were developed.		**CO4**

UNIT – V	**Principles of Clinical Trials**	**Contact Hours : 08**
Genetics/-Omics in Clinical Investigation, Principles of biomarker development and utility, pharmacogenomics including utilization of key knowledge from the human genome projects for personalized medicine. Regulatory and ethical issues involved in translational clinical research.		**CO5**

Lecture Hours : 30	**Tutorials Hours :10**	**Total : 40**

Reference Books:

3. *Charles P. Friedman, Jeremy C. (EDT) Wyatt, , Evaluation methods in Medical Informatics, -Springer verlag*
4. *Hsinnchun Chen, Medical Informatics: Knowledge Management and Data Mining in Biomedicine, Springer*
5. *Dr. Raphael Akangbe, Health Informatics: An Interdisciplinary Approach In Healthcare Management, Repro.*

Text Book:

1. *Mohan Bansl, Medical Informatics-a primer, Tata McGraw-Hill*
2. *De Dombal. F.T, Medical Informatics: The Essential, Butterworth-Heinemann.*
3. *Edward H. Shortlife, Biomedical Informatics-Computer Applications in Health Care and Biomedicine, Springer SIE*

Video Content:

1. *https://www.youtube.com/watch?v=wCivYFb-ujM*
2. *https://www.youtube.com/watch?v=IYsw0RExXdY*
3. *https://www.youtube.com/watch?v=YrOjdrVgVtw*
4. *https://www.youtube.com/watch?v=PLp6U5mUMQQ*
5. *https://www.youtube.com/watch?v=-WfQ-T6Sd7s*
6. *https://www.youtube.com/watch?v=QBVzZBsif20*
7. *https://www.youtube.com/watch?v=HzyUmfc8xCk*
8. *https://www.youtube.com/watch?v=d6xU3bgBLIw*
9. *https://www.youtube.com/watch?v=ZzBzaWoXIcs*
10. *https://www.youtube.com/watch?v=4f7xqwc2lzs*

Department : Biotechnology					
Semester : II			**Course Category Code : HSMC**		
Course Code:	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
HSMC106	**Career Development Communication**		**0**	**0**	**4**	**2**
Prerequisite	*After completion of course students are able to -*				**Bloom's Level**
Course Outcome	**CO1**	*Explain the concept, effect, Importance and role of communication in career enhancement and develop the strategies to overcome common communication barriers.*				K1
	CO2	*Apply leadership principles to real-world scenarios and Enhance ability to lead teams and manage change.*				K2
	CO3	*Enhance Non-Verbal Communication Skills. Learn body postures during an interview.*				K3
	CO4	*Improve personality, Enhance self awareness, Increase Self confidence.*				K1,K3
	CO5	*Enhance Public speaking skills, improve time management and handle Q&A Sessions.*				K2,K3
UNIT - I	**Introduction of Communication skills for Career Development**					**Contact Hours : 6**
Basic Concepts and Importance of Communication skills in Career Development , Nature and Scope of Communication, Barriers to Communication & how to overcome them.						**CO1**
UNIT – II	**Non- Verbal Communication for Career Development**					**Contact Hours : 6**
Body Language and Personal Appearance:- Gestures and Postures, Kinesics and Proxemics, Tips for Improving Non Verbal Communication, Self-Grooming.						**CO2**
UNIT – III	**Communication and Leadership Development**					**Contact Hours : 6**
Tips for Improving Non Verbal Communication, Self-Grooming. Leadership:-Roles and Qualities of good leaders, Listening in Professional Contexts, Barriers to listening.						**CO3**
UNIT – IV	**Personality Development**					**Contact Hours : 6**
Personality Analysis, SWOT Analysis, Personality and other factors that contribute towards Career Development.						**CO4**
UNIT - V	**Presentation skill**					**Contact Hours : 6**
Preparation of PowerPoint presentation, Presentation skills, Seminars and Webinars, Etiquettes & Netiquettes to be followed in:- Personal Interview , Telephonic Interviews, Video conferencing & Seminar.						**CO5**
Lecture Hours : 30	**Tutorial Hours: 0**					**Total : 30**
Reference Books:-						
1- Effective Communication by John Adair London: Pan Macmillan Ltd., 2003. *2- Personality Development and Soft skills by Barun K Mitra , OUP,2012,New Delhi.* *3- Soft Skills and Employability ,Sabina Pillai and Agna Fernandez Cambridge University Press 2018.*						

Text Book:
1- *Technical communication by Malti Agrawal,Krishna Prakashan Media(P) Ltd.*   2- *Communication Skill-1 by Archana Sharma, ASIAN Publisher.*   3- *Business Communication by Dr. Vinod Mishra & Dr. Narendra Shukla, SBPD Publishing House.*
Vedio Links:-
1. *https://youtu.be/K9sDoqOIl18?si=z50-uqUBzKyXCgzy*   2. *https://youtu.be/VJ7bw3K-9TA?si=DDbDFbBeldexBDcU*   3. *https://www.youtube.com/live/NVm-t-zFjqo?si=H5el4P-Xch3Qa-TQ*   4. *https://youtu.be/1NmSdHP7CRI?si=i1IAu9Ssyn80iXqz*

Department: Biotechnology					
Semester : II			**Course Category Code : BSC**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
BSC152	**Analytical Chemistry Lab**		0	0	4	2
Prerequisite	*At the end of this course, the students will be able to:*				**Bloom's Level**
Course Outcome	**CO1**	*Understand the concept of gases and laws governing behavior of gases under different condition.*			K_3
	CO2	*Understand various kinds of solutions and apply those concepts to prepare solutions. Understanding various unit operations related to solution and their applications in industries.*			K_3
	CO3	*Understand different kind of energy and their applications in various biotechnological industries.*			K_3
	CO4	*Apply the fundamental concepts of determination of structure with various spectral techniques and stereochemistry.*			K_4
	CO5	*Develop the understanding of Chemical structure of polymers and its effect on their various properties when used as engineering materials. Understanding the applications of specific polymers and Chemistry applicable in industrial process.*			K_3
UNIT – I	**Gas laws & Equations**				**Contact Hours : 08**
Basic Chemical calculations, Gases-Ideal gas law, other equations of state, Gas mixtures, Gas-liquid mixtures, Partial molar properties - Dalton's Law and Amagot's Law, Partial pressures and density calculations, Henry's law.					**CO1**
UNIT – II	**Solutions**				**Contact Hours : 08**
Types of solutions, expression of concentration of solutions of solids in liquids, concept of Normality, Molarity, Molality, Dilutions and their calculations. Filtration, Mixing, Evaporation, Distillation and Fermentation, Conversion, Yield and Selectivity calculations.					**CO2**
UNIT – III	**Energy and Enthalpy**				**Contact Hours : 08**
Basic Energy Concepts, Internal energy, KE and PE, Enthalpy, Heat capacity, Heat capacity of gases at constant volume and constant pressure conditions, Heat capacity of gaseous mixtures.					**CO3**
UNIT – IV	**Spectroscopic Techniques and Applications**				**Contact Hours : 08**
Elementary idea and simple applications of UV, IR and NMR, Numerical problems. Basic concepts of Optical and Geometrical, isomerism, Chiral Drugs.					**CO4**
UNIT – V	**Materials Chemistry**				**Contact Hours : 08**
Elementary idea of Polymers; Classification, Polymerization processes, Thermosetting and Thermoplastic Polymers, Polymer Blends and Composites, Conducting and Biodegradable polymers, Preparation, properties, industrial applications of Teflon, PVC, Bakelite, Kevlar, Thiokol, Nylon, Buna-N and Buna-S and their environmental impact on society, Speciality, Polymers and Biopolymers.					**CO5**
Lecture Hours : 30		**Tutorials Hours :10**		**Total : 40**	

Reference Books:

1. *Engineering Chemistry by Rath & Singh, 2nd Edition, Cengage Learning India Pvt Ltd Delhi.*
2. *Engineering Chemistry by SS Dara, S Chand & Co Ltd*
3. *Engineering Chemistry by Jain & Jain, S.Chand & Comp, New Delhi*
4. *Engineering Chemistry by K. Sesha Maheswaramma, Pearson*

Text Book:

4. *Engineering Chemistry by OG Palanna, Mc Graw Hill Education, New Delhi*
5. *Engineering Chemistry by Shashi Chawala, Dhanpat Rai Publishing Comp, New Delhi*
6. *University Chemistry by BH Mahan*
7. *University Chemistry by CNR Rao*

Video Content:

1. *https://www.youtube.com/watch?v=IE8-izIba40*
2. *https://www.youtube.com/watch?v=rnvlE3xTqOY*
3. *https://www.youtube.com/watch?v=T1xqwVvtcf8*
4. *https://www.youtube.com/watch?v=SwMODT8m4Ls*
5. *https://www.youtube.com/watch?v=oWdo_tF48Uw&list=PL4BETMztLJZbFn_o0BLmV0QZjxDsJidBI*
6. *https://www.youtube.com/watch?v=l1IIftU0BmU*
7. *https://www.youtube.com/watch?v=j0c0LAMdNX8*
8. *https://www.youtube.com/watch?v=qOVsFLrilLQ*

Department: Biotechnology					
Semester: II			**Course Category Code: ESC**		
Course Code	**Course**		Period/Week		**Credit**
		L	**T**	**P**	**C**
ESC152	**Programming in C Lab**	**0**	**0**	**2**	**1**
Prerequisite	*At the end of this course, the students will be able to:*				
Course Outcome	**CO1**	*Understood the program editing and compilation environment.*			
	CO2	*Able to write simple C programs using most frequently used control structures.*			
	CO3	*Apply the methods problems using arrays and functions.*			
	CO4	*Learnt to handle data processing using structures for simple applications.*			
	CO5	*Write programs that could handle file i/o and pointers.*			

Programming Using C

1. Study of Compilation and execution of simple C programs 2. Basic C Programs, Arithmetic Operations, Area and Circumference of a circ. Swapping with and without Temporary Variables	**CO1**

3. Programs using Branching statements
    a. To check the number as Odd or Even.
    b. Greatest of Three Numbers.
    c. Counting Vowels.
    d. Grading based on Student's Mark.
4. Programs using Control Structures
    e. Computing Factorial of a number
    f. Fibonacci Series generation
    g. Prime Number Checking
    h. Computing Sum of Digit
	CO2

5. Programs using Arrays
    a. Sum of 'n' numbers
    b. Sorting an Array
    c. Matrix Addition, Subtraction, Multiplication and Transpose
6. Programs using Functions
    a. Computing Cr
    b. Factorial using Recursion
    c. Call by Value and Call by Reference
	CO3

7. Programs using String Operations
    a. Palindrome Checking
    b. Searching and Sorting Names
8. Programs using Structure
    a. Student In formation System
    b. Employee Pay Slip Generation
    c. Electricity Bill Generation
	CO4

9. Programs using Pointers
    a. Pointer and Array
    b. Pointers as argument and return value
    c. Pointer and Structure
10. Programs using File Operation
    a. Counting Numbers of Lines, Characters and Black Spaces
    b. Content copy from one file to another
    c. Reading and Writing Data in File
	CO5

Department: Biotechnology					
Semester: II			**Course Category Code : PCC-BT**		
Course Code	**Course**	**Period/Week**			**Credit**
		L	**T**	**P**	**C**
PCCBT152	**Introduction to Biomedical Informatics Lab**	0	0	2	1
Prerequisite	*At the end of the course Students will be able to -*				
Course Outcome	**CO1**	*Understand the application of biomedical informatics in health care.*			
	CO2	*Retrieve data from different resources and apply it.*			
	CO3	*Get substantial knowledge of data collection and data analysis*			
	CO4	*Understand the key concept of translation research*			
	CO5	*Knowledge of different Omics can be used in clinical trial and personalized medicine*			
List of Practical					

List of Practical	CO
1. Introduction to biomedical and health informatics 2. Application of AI in Biomedical informatics	**CO1**
3. Introduction to various computing software. 4. Demonstration of Information retrieval 5. Use of informatics in genomics and other aspects of molecular biology	**CO2**
6. Application of Telemedicine and telehealth 7. Testing of statistical significance- X^2-test, Student's T-test	**CO3**
8. Application of key knowledge from the human genome projects for personalized medicine	**CO4**
9. Describe and demonstrate the clinical decision support 10. Discuss the ethical challenges for the use of data and information in health-related areas.	**CO5**

Department : Biotechnology					
Semester : II			**Course Category Code : ESC**		
Course Code	**Course**		**Period / Week**		**Credit**
			L	**T**	**P**	**C**
ESC156	**Workshop Lab**		0	0	2	1
Prerequisite					**Bloom's Level**
Course Outcome	**CO1**	*Use various engineering materials, tools, machines and measuring equipments.*			K2
	CO2	*Perform manufacturing operations on components in fitting and carpentry shop.*			K1
	CO3	*Perform operations in welding and gas cutting*			K3
	CO4	*Perform operations in molding & casting*			K1
	CO5	*Perform machine operations on lathe*			K2

List of Experiments

1. Introduction to Mechanical workshop material, tools and machines.

2. Perform operations on Lathe - Facing, Plane Turning, step turning, taper turning, threading, knurling and parting.

3. Preparation of U or V -Shape Male Female Work piece which contains: Filing, Sawing, Drilling, Grinding.

4. Study of Carpentry Tools, Equipment and different joints & Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

5. Introduction to BI standards and reading of welding drawings

6. Practice of Making following operations
   Butt Joint
   Lap Joint
   TIG Welding
   MIG Welding

7. Introduction to Patterns, pattern allowances, ingredients of molding sand and melting furnaces. Foundry tools and their purposes.

8. Mould preparation and Aluminum casting

Practical Hrs :24	**Tutorial Hours:00**	**Total Hours: 24**

Reference Books

1. *Workshop Practice Vol 1, and Vol 2, by HazraChoudhary , Media promoters and Publications,*
2. *Mechanical Workshop Practice, K C John, PHI .*
3. *Workshop Practice, H S Bawa, McGraw Hill*