ERA UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME (Effective from Session 2025-26)
B.Sc. BIOTECHNOLOGY
YEAR I, SEMESTER – II

S.No.	Course category	Course code	Course title	Hours/Week			EVALUATION SCHEME				Course Total	C	Attributes						
				L	T	P	Mid Sem Exam	TA	Total	End Sem Exam			Employability	Entrepreneurship	Skill Development	Gender	Environment Sustainability	Human values	Professional Ethics
THEORY																			
1.	Major Own Faculty	B020201T	Molecular Biology& Genetic Engineering	3	1	0	10	15	25	75	100	4	√	√	√				
2.	Major Own Faculty	B020202T	Plant & Animal Science	3	1	0	10	15	25	75	100	4	√		√				
3.	Electives AEC	B020203E	English	4	0	0	10	15	25	75	100	4	√		√				
		B020204E	French										√		√				
4.	Vocational	I020205T	Animation II (Concept of Graphics and Illustration)	2	0	2	10	15	25	75	100	3	√		√		√		
5.	Co-Curricular-I	H020206T	Indian Knowledge System-II	2	0	0	10	15	25	75	100	2	√		√			√	
6.	Co-Curricular-II	H020207T	First Aid & Health	1	0	2	10	15	25	75	100	2	√	√	√		√		
PRACTICALS																			
7.	Major Own Faculty	B020208P	Molecular Bio. & Genetic Eng Lab	0	0	4	10	15	25	75	100	2	√	√	√		√		
Total											**700**	**21**							

STUDENT MAY EXIT AFTER II^ND SEM with CERTIFICATE after completing additional 4 credit training / Research course

L- Lecture T- Tutorial P- Practical C- Credit TA- Teacher Assessment

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ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: Molecular Biology & Genetic Engineering	**Course Code:** B020201T	**Year:** I	**Semester:** II
Co-curricular/Vocational/Core/Elective: Core			
Credits: 4	**Total No. of Lectures:** 60 **Lecture-Tutorial-Practical (in hours/week) L-T-P: 3-1-0**		
Evaluation Spread	**Internal Continuous** 25	**End Term Exam**	75
Course Objective	This course aims to provide an understanding of key discoveries in molecular biology, focusing on DNA replication, transcription, translation, and gene regulation. It covers the foundations of genetic engineering and its applications in research and biotechnology. Students will learn about gene concepts, plasmids, and modern molecular diagnostic tools, as well as various genetic engineering techniques used in biological research and industry.		
Course Outcome	CO1: Learn and understand the important discoveries that are made in the field of molecular biology. CO2: Learn key molecular events that occur during the DNA replication, transcription, translation and regulation of gene concept. CO3: Understand gene concept, plasmids, and wide range of techniques, especially modern molecular tools in diagnosis. □ CO4:Gain knowledge on the foundation of genetic engineering and their applications in biological research diagnostics as well as in biotechnology industries		
Pedagogy	Interactive, discussion-based, student-centered, Presentation		
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations		

UNIT	**Topic**	**No. of Hours**
I	**Gene organization and regulation of gene expression:** Structure of DNA, Types of DNA. □ Gene organization in prokaryotes and eukaryotes. Regulation of gene expression: Prokaryotes: lac and trp operons in *E. coli*.	**7**
II	**DNA Replication and DNA polymerases:** □ Replication of genetic material in prokaryotes and eukaryotes. Structure and function of prokaryotic and eukaryotic DNA polymerases	7
II	**Transcription and mRNA processing:** □ Mechanism of transcription in prokaryotes and eukaryotes. Structure of prokaryotic and eukaryotic RNA polymerases. RNA processing: processing of mRNA (Basic introiduction of Splicing, capping and polyadenylation)	8
IV	**Prokaryotic and eukaryotic translation:** □ Mechanism of initiation, elongation and termination of translation. Brief overview of Posttranslational modifications.	7

V	**Molecular tools in genetic engineering**- Overview, Steps of RDT, Restriction enzymes: Endo & Exonucleases. Modifying enzymes- DNA & RNA polymerase, reverse transcriptase, terminal transferase; nucleases (DNases, RNases, S1) T4 polynucleotide kinase, Alkaline Phosphatase and ligase (*E.coli*& T4).	7
VI	**Vectors:** Plasmid- definition, properties and types: Plasmid vectors (pUC19 & pBR322), phage vectors (λ & M13), cosmid vectors, shuttle and expression vectors; Artificial chromosome vectors (BAC & YAC).	8
VII	**Cloning and Screening of recombinant host cells:** Gene Cloning, Screening and characterization of cloned DNA, Insertional Inactivation, Blue-White Screening. Gene Libraries: Preparation and comparison of Genomic DNA and cDNA library.	8
VIII	**Molecular Biology techniques:** DNA isolation (Plasmid/ Genomic DNA isolation), PCR and its applications, Sequencing, DNA Fingerprinting, Blotting (Southern, Northern, Western), Electrophoresis of nucleic acids and proteins, Site directed mutagenesis.	8

Suggested Readings

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014).
2. Cooper, G. M., and Hausman, R. E. (2013). The Cell: a Molecular Approach (6th
3. Ed.). Washington: ASM ; Sunderland.
4. Karp, G. Cell and Molecular Biology. Concepts and experiments. John Harris, D.,
5. Wiley & sons, New York
6. Lodish, H F. Berk, A. Kaiser, CA, Krieger, M. Bretscher, A. Ploegh, H. Aman, A.
7. Gupta P.K. Cell and Molecular Biology 2018. 5th edition Rastogi Publication India.
8. Brown TA. Gene cloning and DNA analysis: An introduction. (2016) 7th Edition.
9. Wiley-Blackwell
10. Micklos, DA & Freyer, CA. DNA Science: A first course in Recombinant DNA Technology(2nd Edition) –Cold Spring harbor laboratory press, NY
11. Satyanarayana U (2020). Biotechnology. Books and Allied (P) Ltd
12. Singh BD. (2015). Biotechnology: Expanding Horizons (4th edition). Kalyani Publishers
13. Dubey RC. (2014) A Textbook of Biotechnology(5th edition) S Chand and Company Ltd.

Course created by: Dr. Salma Rizvi

Approved by:

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO2
IV	CO2
V	CO4
VI	CO3
VII	CO4, CO3
VIII	CO4, CO3

6/9/25

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	√		√	√	√	√	√		√		√		√		√	
CO2	√		√	√	√	√	√		√		√		√		√	
CO3	√		√	√	√	√	√		√		√		√		√	
CO4																

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Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: Plant & Animal Science		**Course Code:** B020202T	**Year:** I	**Semester:** II
Co-curricular/Vocational/Core/Elective: Core				
Credits: 4	**Total No. of Lectures:** 60 **Lecture-Tutorial-Practical (in hours/week) L-T-P:** 3-1-0			
Evaluation Spread	**Internal Continuous**	25	**End Term Exam**	75
Subject prerequisites	To study this subject, a student must have had biology in class 12th			
Course Objective	The course should enable the students to understand in depth about the cellular organization of plant and animal cells-structure and physiology, learn about taxonomy of plants.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: The students should be able to identify the distinguishing anatomical features of various parts of plant and animal. CO2: Ascertain what taxa commonly seen plants and animals belong to. CO3: Students will be able to learn about plant classification and plant physiology. CO4: Students will be able to know about plant photosynthesis and animal kingdom.			
Pedagogy	Interactive, discussion-based, student-centred, Presentation			
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations			

UNIT	Topic	No. of Lectures
I	**Classification of living organisms:** Purpose of classification, biological nomenclature, five-kingdom classifications and their characteristic features, three domains classification, taxonomy and phylogenetics.	7.5 Hrs
II	**Cellular organization:** Structure and function of Plant tissues-Meristematic tissue; Permanent Tissue: parenchyma, collenchyma, sclerenchyma, xylem and phloem; Epidermal, ground and vascular tissue system; Anatomy of monocot and dicot plants- stems, roots and leaves; Structure and function of Animal Tissues-Epithelial, connective, muscular and nervous tissues.	7.5 Hrs
III	**Plant kingdom:** General characters of the plant kingdom, classification of the plant kingdom	7.5 Hrs
IV	**Economic Aspect of Plant Kingdom;** economic aspects of Algae, economic aspects Fungi, economic aspects Bryophytes, economic aspects Pteridophytes, economic aspects Gymnosperms and Angiosperms.	7.5 Hrs
V	**Classification of the Plant Kingdom of the different phyla:** Protozoa Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Mollusca,	7.5 Hrs

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	Arthropoda, Echinodermata, Chordates.	
VI	**Plant physiology:** Diffusion and osmosis, Water potential, Ascent of sap, Absorption of water and minerals, translocation of photo assimilates, Transpiration, physiology of stomata;	**7.5 Hrs**
VII	**Photosynthesis:** Light harvesting complexes, CO2 fixation- C3, C4 and CAM pathways; Plant growth hormones, their physiological effects and mode of action, Photomorphogenesis- Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; Concept of photoperiodism and vernalization	**7.5 Hrs**
VIII	**Animal kingdom:** General characteristics of the different phyla- Protozoa Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Mollusca, Arthropoda, Echinodermata, Chordates.	**7.5 Hrs**

Suggested Readings

1. Biology PH Raven & G.B Johnson
2. Biological science DJ Taylor NPO Green GW Stout
3. A textbook of Botany S.N Pandey, P.S Trivedi
4. Plant Physiology by Taiz & Zeiger.
5. Malik C.P. Plant Physiology, Kalyani Publishers

Dr. Ishrat Fatima

Course created by:

Approved by:

UNIT	MAPPED CO
I	CO1, CO2
II	CO1
III	CO2, CO3
IV	CO2, CO3
V	CO3
VI	CO3
VII	CO4
VIII	CO4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	√	√	√	√	√	√	√		√		√		√	√	√	
CO2	√	√	√	√	√	√	√		√		√		√	√	√	
CO3	√	√	√	√	√	√	√		√		√		√	√	√	
CO4	√	√	√	√	√	√	√		√		√		√	√	√	

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Course Outline
Academic Year: 2025-26

Course Name: English Language	**Course Code:** B020203E	**Year: I**	**Semester: II**
Co-curricular/Vocational/Core/Elective: Elective / AEC			
Credits: 4	**Total No. of Lectures: 60 Lecture-Tutorial-Practical (in hours/week) L-T-P:4-0-0**		
Evaluation Spread	**Internal Continuous** 25	**End Term Exam**	75
Course Objective	a) To provide an overview of prerequisites to Effective Speaking b) To put in use the basics of Grammar c) To provide an outline to comprehend Language through Literature d) To underline the nuances of Reading and Writing techniques		
Course Outcome	• CO1: To demonstrate his/her ability to communicate by making correct use of professional vocabulary & grammar. • CO2: To achieve effectiveness in Listening, Speaking, Reading and Writing. • CO3: To comprehend excerpts from Literature through effective understanding of English Language • CO4: To comprehend functional English and its usage		
Pedagogy	Interactive, discussion-based, student-centered, Presentation		
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations		

UNIT	**Topic**	**No. of Lectures**
I	**UNIT I: Basics of Grammar** Parts of Speech with Emphasis on Articles, Prepositions, Verb, Adverbs, Tenses and their Uses, Transformation, Question Tags, Paragraph Organization, Vocabulary building	05
II	**UNIT II: Effective Speaking** Professional and General Communication, Putting the message across, Professional Introduction, Group Discussion, Delivering Short Speeches, Listening, Body Language, Stress, Intonation and Modulation	05
II	**UNIT III: Reading Techniques** Speed Reading Reading Techniques: Skimming and Scanning Activity/ Drills for Skimming and Scanning	05
IV	**UNIT IV: Writing Techniques** Steps to Effective Writing: Pre-writing, Writing, Proofreading, Editing Note Taking: Linear and Patterned Notes	05
V	**Unit V- Listening skills** Definition and importance Listening in different contexts- Professional, Personal, Educational	10

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	Types of listening Improving listening skills- how to cultivate Good Listening Habits Listening Vs. Hearing- Definition and Difference	
VI	**Unit VI- Comprehension using Language through Literature** William Faunlkner"- "A Rose for Emily" James Joyce: "Araby" (Dubliners) Guy de Maupassant: The Umbrella"	10
VII	**Communication Practice through Activities -1** **Activity 1:** Active Listening Exercise Objective: Improve active listening skills. **Activity 2:** Nonverbal Communication Role-Play Objective: Enhance awareness of nonverbal cues in communication. **Activity 3:** Empathy Mapping Objective: Foster empathetic communication. **Activity 4:** Conflict Resolution Simulation Objective: Practice communication skills in conflict situations.	10
VIII	**Communication Practice through Activities-2** **Activity 5:** Persuasive Speech Objective: Develop persuasive communication skills. **Activity 6:** Group Problem-Solving Task Objective: Enhance collaborative communication. **Activity 7:** Feedback and Critique Session Objective: Improve skills in giving and receiving constructive feedback. **Activity 8:** Cultural Communication Differences Workshop Objective: Increase awareness of cultural influences on communication.	10

Suggested Readings

1. Professional Communication. 2nd edition by Meenakshi Raman and Sangeeta Sharma. Oxford University Press 2014.
2. Professional Communication. 3rd edition by Raavee Tripathi. SK Kataria and Sons. 2016.
3. Communication Skills by Sanjay Kumar and Pushp Lata. Oxford University Press. 2017.
4. Text References:
   http://armytage.net/updata/enotes-rose-emily-guide.pdf
   https://www.plato-philosophy.org/wp-content/uploads/2016/05/Araby.pdf
   https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200502131605664 5Vineet_David- The-Umbrella.pdf
5. Brownell, J. (2012). "Listening: Attitudes, Principles, and Skills." Pearson Higher Ed
6. Knapp, M. L., Hall, J. A., & Horgan, T. G. (2013). "Nonverbal Communication in Human Interaction." Wadsworth.
7. Osterwalder, A., & Pigneur, Y. (2010). "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers." Wiley.
8. Deutsch, M., Coleman, P. T., & Marcus, E. C. (2011). "The Handbook of Conflict Resolution: Theory and Practice." Jossey-Bass.
9. Lucas, S. E. (2019). "The Art of Public Speaking." McGraw-Hill Education.
10. Johnson, D. W., & Johnson, F. P. (2013). "Joining Together: Group Theory and Group Skills." Pearson.
11. Stone, D., Patton, B., & Heen, S. (2010). "Difficult Conversations: How to Discuss What Matters Most." Penguin Books.
12. Stone, D., Patton, B., & Heen, S. (2010). "Difficult Conversations: How to Discuss What Matters Most." Penguin Books.

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Course created by:

Dr. Rupali Mirza
Ms. Saleha Jafri
Dr. Aqeel Abbas
Ms. Vishakha Mehrotra

Approved by:

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO2
IV	CO2
V	CO2
VI	CO3
VII	CO4

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1					√		√		√						√	
CO2					√		√		√						√	
CO3					√		√		√						√	
CO4					√		√		√						√	

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: French		**Course Code:** B020204E	**Year:** I	**Semester:** II
Co-curricular/Vocational/Core/Elective: Elective / ~~AEC~~				
Credits: 4	**Total No. of Lectures: 60**		**Lecture-Tutorial-Practical (in hours/week) L-T-P: 4-0-0**	
Evaluation Spread	**Internal Continuous**	25	**End Term Exam**	75
Subject prerequisites	To study this subject, a student must have class 12th			
Course Objective	To be able to speak, read, write, listen and understand elementary French			
Course Outcome	CO1: **Reading and vocabulary** : Pronunciation of French alphabets; Listening and understanding small French dialogues based on salutations, greetings and meeting strangers; Introducing vocabulary related to personal information and that of others; Introducing French vocabulary e.g. Numbers 1-100, Days of the week, Months of the year; Seasons, Time and describing different activities of the day; Means of Transport and parts of the human body; Listening and singing French songs based on alphabets, colours, days of the week, months, seasons, numbers 1-100 etc . CO2: **Grammar and writing skills:** Introducing articles, nouns, genders, prepositions; adjectives, adverbs, partitif articles, Relative pronouns; direct and indirect pronouns; Conjugation of auxiliary and elementary verbs in the Present and Past tenses; Dialogues based on different situations related to clock, time etc. Introducing oneself and others; Describing a portrait, product/thing; writing informal letters; solving grammatical exercises based on imperatives; regular/ irregular 'er', 'ir', 're' verbs; reflexive verbs commonly used verbs like vouloir, pouvoir, aller, venir etc. Writing small essays and invitation letters; practicing listening activities related to different situations e.g. classroom, home, roadside; Writing and responding to invitation cards; Writing small formal and informal dialogues; Use of affirmative, interrogative and negative sentences based on formal/informal situations. **CO3: Speaking** and introducing oneself to a group; Introducing your family to others; Interacting and understanding small French oral/listening dialogues based on introduction of oneself and others; speaking about one's personal tastes, likes/dislikes, preferences, hobbies and habits; information about one's involvements with different; food habits, giving opinion about different activities. Dialogue making activities based on different situations and topics as mentioned above. **CO4: Listening** to French songs and Oral dialogues, understanding and interacting in different situations e.g Supermarkets, Railway station, Airport, Restaurant and Classroom; Interacting and understanding small French oral/listening dialogues based on the above mentioned topics.			

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Pedagogy	Pedagogic method will be based on teaching of four skills i.e. reading, writing, listening and speaking based on lessons in the Text book. External support from written exercises, role play, songs, quiz, cross word puzzles and most important listening to French CDs and games.	
Internal Evaluation Mode	Organizing Oral exams to evaluate both Spoken and Listening skills; Conducting exams to evaluate written Comprehension skills, informal letters and short essays. Internal Oral exams to be evaluated internally; External examiners to be invited for Final exams.	
UNIT	**Topic**	**No. of Lectures**
I	**Reading and Listening skills:** French Alphabets; Greetings and salutations; Listening to CDs based on different themes for oral and written dialogue formation e.g.; Listening to dialogues based on different situations related to Numbers 1-100; Days of the week; Months of the year; weather; nationalities in the world; and names of francophone countries; introduce names of objects in class, transport and surroundings; vegetables, fruits and different parts of human body along with their genders; Introduce oneself/ object. Describe tastes, habits, relaxing activities; sports; gentle; purchasing food items at the shop/market; giving/ buying\selling food items/ ordering at hotels, restaurants etc.	**15 hrs**
II	**French Grammar, Vocabulary and writing skills:** Introducing Grammar e.g. Articles/genders, Nouns, Subject pronouns; Conjugation of Auxiliary verbs; Preposition; Introduce another family/friend; Reflexive verbs; Practicing question/answers from visiting cards/applications; Introducing three groups of verbs, regular verbs; different kinds of Adjectives, Affirmative, Negative and Interrogative sentences; Vocabulary related to Numbers 1-100; Days of the week; Months of the year; weather; nationalities in the world; and names of francophone countries; introduce names of objects in class, transport and surroundings; vegetables, fruits and different parts of human body along with their genders; Introduce oneself/ object; Writing and replying to informal letters and small descriptive essays.	**25 hrs**
III	**French Spoken and listening skills:** Introducing own family member/ friend; another person's likes/ dislikes; Talk about French festivals; Different professions; Describing one's day-to-day activities; tastes and preferences, hobbies, likes and dislikes of an individual; Numbers 1-100; Building small dialogues, speaking and understanding their themes related to different situations like buying and selling of grocery items/ clothes/ meat, vegetables and fruits; dialogues used at the market, railway station; airport; class room, home, school, class, supermarket, restaurant, hotel, shops; Describing different activities of the day based on the timetable given at different places.	**20 hrs**

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Suggested Readings:

1a. "Latitudes 1", Methode de Francais by Regine Merieux and Yves Loiseau, Didier
1b. "Latitudes 1", Cahier d'exercices by Regine Merieux and Yves Loiseau, Didier
2. « Festival », Methode de Français, by Sylvie Poisson-Quinton, Michele Maheo-Le Coadic, Anne Vergine- Sirieys
3a. "Saison 1" Inclus 2 CDs ; Methode de Francais by Marie-Noelle Cocton, Elodie Heu, Catherine Houssa, Emilie Kasazain, Didier.
3b "Saison 1" Inclus 1 CD ; Cahier d' activites Marion Alcaraz, Dorothee Escoulfier, Camille Gomy, Mathilde Landier, Delphine Ripaud, Francine Quemener,

Course created by: Prof. Meeta Ghosh (H.O.D) French **Approved by:**

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO2
IV	CO3, CO4

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1			√				√								√	
CO2			√				√								√	
CO3			√				√								√	
CO4			√				√								√	

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: Animation II (Concept of Graphics and Illustrations)		**Course Code:** 1020205T		**Year: I**	**Semester: II**
Co-curricular/Vocational/Core/Elective: Vocational					
Credits: 3	**Total No. of Lectures: 60** (prorated for 30 theory + 30 practical hours) **Lecture-Tutorial-Practical (in hours/week) L-T-P: 1:0:2**				
Evaluation Spread	**Internal Continuous**	25	**End Term Exam**	75 (Practical +Theory) (55 + 20)	
Course Objective	This course provides an introduction to Adobe Illustrator, focusing on its application in the field of biotechnology. Students will learn to create professional-quality graphics, diagrams, and illustrations that can be used in research papers, presentations, and publications.				
Course Outcome	CO1: Create and manipulate vector graphics for scientific purposes CO 2: Design detailed and accurate scientific diagrams and illustrations CO3: Integrate illustration skills into biotechnology research and presentations CO 4: Produce publication-quality graphics for academic and professional use				
Pedagogy	Demonstrations, Art Excursion, Interactive and activity based class sessions, skills-based activities				
Internal Evaluation Mode	Sessional Test: 10 marks Practical: 10 marks Viva: 03 marks Assignments/Attendance/Presentation: 02 marks				

UNIT	Topic	No. of Lectures
I	**Introduction to computer Graphics and Illustrations**	4
II	**Introduction to Adobe Illustrator** • Too bar • Detailed overview of Menu bar	4
II	**Adobe Illustrator** • Drawing and Transforming Objects • Working with Shapes and Objects • Gradients, Pattern Fills, and Blends	20
IV	**Concept of Colour Theory (Advanced):** Application Color in Diverse Design Applications • Colour Psychology	4
V	**Anatomical Drawing:** • Anatomy proportion • Portrait and portraiture	7
VI	**Multimedia system in Fundamentals of Advertising:** • Role of Multimedia: Enhancing engagement and interactivity • Advertisement campaigns	6
VII	**Typography and its types: Serif and San Serif fonts** • Adding and formatting text • Working with fonts and type effects	5

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VIII	**Design Projects:** • Logo designing • Info graphics and data visualization • Artwork for print and web	10

Suggested Readings:

Color wheel, a color palette generator | Adobe Color
Color contrast checker analyzer tool | Adobe Color
What are Portraits and Portraiture in Art: An Overview - (whataportrait.com)
16c46520-b53b-4818-95df-997ca0119488.243bc542-f038-43c4-82da-126fe15bf11f.pdf (adobe.com)
The 7 Types of Logos And How to Use Them | VistaPrint US
Learn Anatomy to Improve Drawing the Human Body | Art Rocket (clipstudio.net)

MAPPED CO's WITH PO's & PSO's

UNITS	MAPPED CO
I	CO2,
II	CO1
III	CO1
IV	CO2, CO3
V	CO2, CO3
VI	CO2, CO3
VII	CO2, CO3, CO4
VIII	CO4

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7	PSO 8
CO1		√	√		√		√		√		√	√	√			
CO2	√	√			√	√	√	√		√	√	√	√	√		
CO3			√	√	√		√	√	√	√		√	√	√	√	√
CO4	√	√			√	√	√	√		√	√	√	√	√		

Course created by: Ms. Hershika Verma
Department of Liberal Education

Signature: 8/9/25

Approved by:

Signature:

sangeeta

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: **Code:**	**Indian Knowledge System II** **H020206T**		**Semester:**	**II**	
Co-Curricular/vocational/Core/Elective/Minor: Co-Curricular-I					
Credits	**2**		**Total sessions**	**30**	
Evaluation Spread	**Internal Continuous Exam**	**25**	**End Term Exam**	**75**	
Subject Prerequisites	**Semester 1 passed/promoted**				
Course Objectives	The objectives of this course are:- • To make students understand about Classical Frameworks of Knowledge in Everyday life • To make students aware about Indian Philosophical and Scientific Contributions to Society • To make students aware about the Ecological and Cosmic Interconnectedness in Human Life To make students explore Classical Indian Medical Systems and Sustainable Practices				
Course Outcomes	• Students will able to critically analyze the classical Indian frameworks of knowledge • Students will able to demonstrate key philosophical traditions and their scientific contributions in mathematics, astronomy and architecture • Students will able to articulate the principles of ecological interdependence through concepts such as Jeev–Nirjiv Sambandh • Students can apply foundational Ayurvedic concepts in everyday life				
Pedagogy	Interactive, Analytical-Discussion and action-learning.				
Internal Evaluation	Sessional Test; Quiz; Assignments; Attendance; Presentations				
Sessions	**Topics**				**Hrs.**
Unit 1	**Knowledge in Everyday life** • Four Branches of Knowledge(Kautilyan Notion) • Prakriti : Meaning and Impact on Knowledge creation (Individual, Society, Region and Time) • Dharma and Nature (How nature follow its Dharma **Activity:** Poster presentation on Dharma and Nature relationship				7

Unit 2	**Bhartiya Darshan: Mind and Self** • Vaidic and Non Vaidic Darshan • Relationship of Darshan with Astronomy and Mathematics • Contributions of Aryabhatta (Mathematics and Astronomy), Varahamihira (Astronomy and Architecture) **Activity:** One pager on topic given	**8**
Unit 3	**Science of Life-I** • Interconnectedness of Life: Jeev- Nirjiv Sambandh • Understanding the essence of Panchamahabhutas (Five Elements) • Tridoshas—Vata, Pitta, and Kapha and it realtionship with Panchamahabhutas **Activity:** PPT presentation on given topic	**7**
Unit 4	**Science of Life-II** • Indian Classical Medicinal Aspects: Kaya Chikitsa by Charaka • Ashtanga Ayurveda • Sustainable Living(An Atharvaveda reflection) **Activity:** Short Video/Collage presentation on given topic	**8**
	Total Hours	**30 Hrs**
Suggested Readings/ Reference Books	• Ray, A., & Chakrabarti, D. K. (1975). Studies in ancient Indian technology and production: a review. *Journal of the Economic and Social History of the Orient/Journal de l'histoire economique et sociale de l'Orient*, 219-232. • Narlikar, J. V. (2002). *An introduction to cosmology*. Cambridge University Press. • Dalrymple, W. (2025). *The golden road: how ancient India transformed the world*. Bloomsbury Publishing USA • https://iksindia.org/ebook.php	

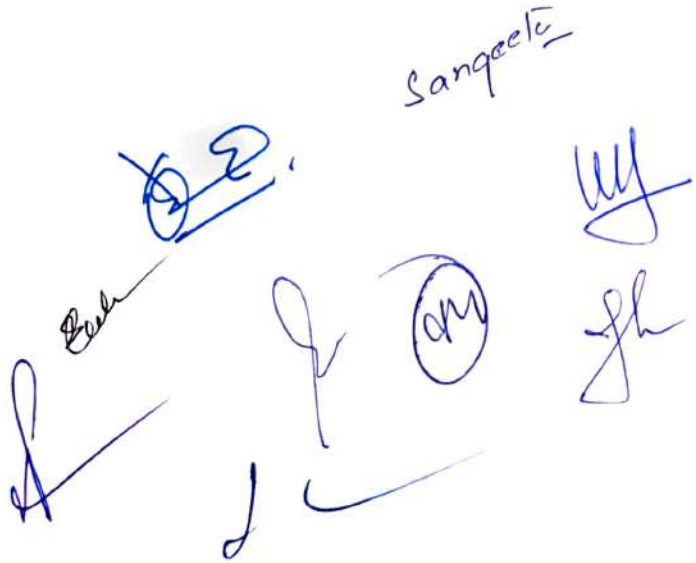
Course Created By:-
Dr. Saurabh Tiwari
Assistant Professor,
Era University, Lucknow

Course Approved By:-

UNIT	MAPPED CO
I	CO1, CO2
II	CO2
III	CO3, CO4
IV	CO1, CO5

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	√				√	√	√	√		√	√		√	√		
CO2	√				√	√	√	√		√	√		√	√		
CO3	√				√	√	√	√		√	√		√	√		
CO4	√				√	√	√	√		√	√		√	√		
CO5	√				√	√	√	√		√	√		√	√		



ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: First Aid & Health		**Course Code:** H020207T	**Year:** I	**Semester:** II
Co-curricular/Vocational/Core/Elective: Co-Curricular-II				
Credits: 2	**Total No. of Lectures:** 30 **Lecture-Tutorial-Practical (in hours/week) L-T-P:** 1-0-2			
Evaluation Spread	**Internal Continuous**	25	**End Term Exam**	75
Subject prerequisites	To study this subject, a student must have had biology in class 12th			
Course Objective	The main objective is not to treat people but to provide immediate attention to a sick or injured person at the scene. First aid helps prevent the situation from getting worse while waiting for full medical care. Helps preserve life. It prevents the escalation of illness or injury. It promotes recovery and provides pain relief.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Learn the skill needed to assess the ill or injured person. CO2: Learn the skills to provide CPR to infants, children and adults. Learn the skills to handle emergency childbirth. CO3: Learn the Basic sex education help young people navigate thorny questions responsibly and with confidence. CO4: Learn the basic sex education, help youth to understand sex is normal. It's a deep, powerful instinct at the core of our survival as a species. Sexual desire is a healthy drive. Help to understand natural changes of adolescence. CO5: Learn the skill to identify Mental Health status and Psychological First Aid.			
Pedagogy	Interactive, discussion-based, student-centered, Presentation			
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations			

UNIT	Topic	No. of Lectures
I	**Basic First Aid:** Aims of first aid & First aid and the law, Dealing with an emergency, Resuscitation (basic CPR), Recovery position, Initial top to toe assessment, Hand washing and Hygiene, Types and Content of a First aid Kit. **First AID Technique:** Dressings and Bandages, Fast evacuation techniques (single rescuer), Transport technique. **First aid related with respiratory system:** Basics of Respiration, No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging, Swelling within the throat, Suffocation by smoke or gases and Asthma. **First aid related with Heart, Blood and Circulation:** Basics of The heart and the blood circulation, Chest discomfort, bleeding. **First aid related with Wounds and Injuries:** Type of wounds, Small cuts	**2T + 10 P**

	and abrasions, Head, Chest, Abdominal injuries, Amputation, Crush injuries, Shock. **First aid related with Bones, Joints Muscle related injuries:** Basics of the skeleton, Joints and Muscles, Fractures (injuries to bones)	
II	**First aid related with Nervous system and Unconsciousness:** Basics of the nervous system, Unconsciousness, Stroke, Fits -convulsions- seizures, Epilepsy. **First aid related with Gastrointestinal Tract:** Basics of the gastrointestinal system, Diarrhea, Food poisoning. **First aid related with Skin Burns:** Basics of the skin, Burn wounds, Dry burns and scalds (burns from fire, heat and steam), Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke, Frost bites (cold burns), Prevention of burns, Fever and Hypothermia. **First aid related with Poisoning:** Poisoning by swallowing, Gases, Injection, Skin. **First aid related with Bites and Stings:** Animal bites, Snake bites, Insect stings and bites. **First aid related with Sense organs:** Basic of Sense organ, Foreign objects in the eye, ear, nose or skin, Swallowed foreign objects. **Specific emergency satiation and disaster management:** Emergencies at educational institutes and work, Road and traffic accidents, Emergencies in rural areas, Disasters and multiple casualty accidents, Triage. **Emergency Child birth**	**2T + 10 P**
III	**Basic Sex Education:** Overview, ground rules, and a pre-test, Basics of Urinary system and Reproductive system, Male puberty-physical and emotional changes, Female puberty-physical and emotional changes, Male-female similarities and differences, Sexual intercourse, pregnancy, and childbirth, Facts, attitudes, and myths about LGBTQ+ issues and identities, Birth control and abortion, Sex without love -harassment, sexual abuse, and rape, Prevention of sexually transmitted diseases.	**9T**
IV	**Mental Health and Psychological First Aid:** What is Mental Health First Aid? Mental Health Problems in the India, The Mental Health First Aid Action Plan, Understanding Depression and Anxiety Disorders, Crisis First Aid for Suicidal Behavior& Depressive symptoms, What is Non-Suicidal Self-Injury? Non-crisis First Aid for Depression and Anxiety, Crisis First Aid for Panic Attacks, Traumatic events, Understanding Disorders in Which Psychosis may Occur, Crisis First Aid for Acute Psychosis, Understanding Substance Use Disorder, Crisis First Aid for Overdose, Withdrawal, Using Mental Health First Aid.	**2T + 10 P**

Suggested Readings

1. Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf.
2. Red Cross First Aid/CPR/AED Instructor Manual.
3. https://mhfa.com.au/courses/public/types/youthedition4.
4. Finkelhor, D. (2009). The prevention of childhood sexual abuse. Durham, NH: Crimes Against Children Research Center. www.unh.edu/ccrc/pdf/CV192. pdf.
5. Kantor L. & Levitz N. (2017). Parents' views on sex education in schools: How much do Democrats and Republicans agree? PLoS ONE, 12 (7): e0180250.

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6. Orenstein, P. (2016). Girls and sex: Navigating the complicated new landscape. New York, NY: Harper. .
7. Schwiegershausen, E. (2015, May 28). The Cut. www.thecut.com/2015/05/most-women-are-catcalled-before-they-turn-17.html.
8. Wiggins, G. &McTighe, J. (2008). Understanding by design. Alexandra, VA: ASCD.
9. https://marshallmemo.com/marshall-publications.php#8

Course created by: **Approved by:**

UNIT	MAPPED CO
I	CO1, CO2
II	CO2
III	CO3, CO4
IV	CO1, CO5

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	√				√	√	√	√		√	√		√	√		
CO2	√				√	√	√	√		√	√		√	√		
CO3	√				√	√	√	√		√	√		√	√		
CO4	√				√	√	√	√		√	√		√	√		
CO5	√				√	√	√	√		√	√		√	√		

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2025-26

Course Name: Molecular Biology & Genetic Engineering Lab.		**Course Code:** B020208P	**Year:** I	**Semester:** II
Co-curricular/Vocational/Core/Elective: Core				
Credits: 2	**Total No. of Lectures:** NIL **Lecture-Tutorial-Practical (in hours/week) L-T-P:**0-0-4			
	Internal Continuous	25	**End Term Exam**	75
Subject prerequisites	To study this subject, a student must have had biology in class 12th			
Course Objective	The objective of this course is to develop the understanding of basics of RDT and PCR, chromatography, TLC, determination of surface tension, density, viscosity and density of liquids and Isolation of piperine and caffeine from its respective source.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Isolate genomic DNA from plant and animal tissues. CO2: Isolate plasmid DNA (E. coli). CO3: Perform Agarose Gel Electrophoresis. CO4: Transformation of *E. coli* cells CO5: Understand basics of PCR CO6: Quantitative estimation of DNA and RNA by DPA and Orcinolmethod,respectively.			
Pedagogy	Interactive, discussion-based, Practical's			
Internal Evaluation Mode	Sessional Test; Viva; Attendance; Lab Record			

Lab Course	**List of Experiments**	**Practical (in Hrs)**
Molecular biology I	1. Isolation of genomic DNA from leaves 2. Isolation of genomic DNA from Blood 3. Agarose gel electrophoresis 4. Agarose gel electrophoresis and identification of band sizes. 5. SDS-PAGE 6. Isolation of RNA 7. To estimate the DNA concentration by DPA method 8. To estimate the RNA concentration by Orcinol method	**30Hrs**
Genetic Engineering II	1. Isolation and purification of Plasmid DNA (E. Coli) 2. Restriction digestion of DNA 3. Ligation of DNA fragments 4. Competent cell Preparation 5. Transformation of E.Coli cells 6. Blue White Screening 7. Demonstration of Polymerase chain reaction.	**30Hrs**

Suggested Readings

1. Lodish, H F. Berk, A. Kaiser, CA, Krieger, M. Bretscher, A. Ploegh, H. Aman, A. Martin, K. (2016). Molecular Cell Biology (8th Ed.). New York: W.H. Freeman.
2. Gupta P.K. Cell and Molecular Biology 2018. 5th edition Rastogi Publication India.
3. Barker K (2004). At the Bench: A laboratory Navigator. Cold Spring Harbor Laboratory Press. USA.
4. Iwasa J., Marshal W. Karp's Cell and Molecular Biology. Concepts and experiments. (2015) (8th edition) Wiley & sons, New York
5. Watson, J. D. Baker TA, Bell, SP Gann, A. Levine, M. Losick R. (2008). Molecular Biology of the Gene (5th ed.). Pearson.
6. Sambrooket al (2000) Molecular cloning Volumes I, II, & III Cold spring HarborLaboratory Press, New York, USA.

Dr. Saliha Rizvi 6/9/25

Course created by: **Approved by:**

MAPPED CO's WITH PO's & PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	√	√	√	√	√	√	√		√	√	√		√	√	√	
CO2	√	√	√	√	√	√	√		√	√	√		√	√	√	
CO3	√	√	√	√	√	√	√		√	√	√		√	√	√	
CO4	√	√	√	√	√	√	√		√	√	√		√	√	√	
CO5	√	√	√	√	√	√	√		√	√	√		√	√	√	
CO6	√	√	√	√	√	√	√		√	√	√		√	√	√	

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