ERA UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME (Effective from Session 2024-25)
B.Sc. BIOTECHNOLOGY
YEAR III, SEMESTER – V

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	BBT0501T	Plant and animal Biotechnology	3	1	0	12	18	30	70	100	4	√	√	√		√		
2.	Major Own Faculty	BBT0502T	Food Biotechnology	3	1	0	12	18	30	70	100	4	√	√	√		√		
3.	Major Own Faculty	BBT0503T	Basics of plant and animal sciences	3	1	0	12	18	30	70	100	4	√		√		√		
4.	Major Own Faculty	BBT0504T	Proteomics, Genomics and Metabolomics	3	1	0	12	18	30	70	100	4	√	√	√		√		
5.	Major Own Faculty	BBT0505T	IPR Biosafety & Ethical Issues	3	1	0	12	18	30	70	100	4	√		√		√		√
PRACTICALS																			
6.	Major Own Faculty	BBT0506P	Laboratory Course V (Plant & animal Biotech + Food Biotechnology)	0	0	6	12	18	30	70	100	3	√	√	√		√		
7.	Major Own Faculty	BBT0507R	Educational Visit + Seminar	2	0	2	-	-	100	-	100	3	√	√	√		√		
Total											**700**	**26**							

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

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2024-25

Course Name: Plant & Animal Biotechnology	**Course Code:** BBT0501T	**Year:** III	**Semester:** V
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**	30	**End Term Exam**	70

Subject prerequisites	To study this subject, a student must have had biology in class 12th
Course Objective	The broad objective of the present core course is to provide an overview of plant and animal biotechnology. In this respect, students will be acquainted with principles and applications of different techniques of plant and animal cell/tissue culture and genetic transformation. In case of cell and tissue culture, the focus shall be on media composition and preparation, methods of in vitro regeneration, their applications and limitations. With respect to genetic transformation, the focus will be on detection and characterization of transformants. Further, the global status of GMOs, various case studies illustrating the application of biotechnology in developing crop varieties resistant to various biotic and abiotic stresses, enhancing nutritional quality and knock-out animal technology would be dealt in detail.
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Students will be gaining in-depth knowledge about the principles and applications of plant tissue culture and animal cell culture. CO2: Development of plant transformation vectors specifically designed to facilitate transfer of improved/unique genetic traits to plants, and to provide knowledge on diverse genetic transformation technologies available for the production of transgenic plants in crop improvement programs. CO3: Familiarization with knock-out and transgenic animals to model disease and study gene function.
Pedagogy	Interactive, discussion-based, student-centered, Presentation
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations

UNIT	**Topic**	**No. of Lectures**
I	**Basics of Plant Tissue culture and techniques**- Plant tissue culture: concept and application, General requirements for plant tissue culture, Various sterilization techniques; Tissue culture media- composition and preparation, Initiation and maintenance of callus culture and suspension culture, Protoplast isolation, culture and viability test, Somatic hybridization and Cybridization. Cellular totipotency- Organogenesis and somatic embryogenesis- methods and application. Synthetic seeds production, Germplasm conservation and cryopreservation- methods and application.	**15 Hrs**
II	**Transgenic Plants and application:** Introduction to Transgenic plants, Agrobacterium mediated gene transfer and use of Ti plasmid; Applications of tissue culture engineering- pathogen resistance (Bt gene), herbicide tolerance and golden rice development.	**12Hrs**
III	**Introduction to Animal Tissue Culture:** Animal tissue culture- concept and application, minimal requirement for cell culture, Various types of contamination, Aseptic conditions and methods of sterilization, Natural and synthetic media, physicochemical properties of culture media,	**15Hrs**

	balance salt solutions, complete culture media, cell adhesion and cell surface molecules of cultured cells	
IV	**Tissue culture techniques and application:** Initiation of cell culture and cell lines development, growth curve of cultured cells, Primary cell culture- various isolation techniques, establishment of cell lines- finite and continuous cell lines, immortalization of cell lines, maintenance of cell culture, passaging and freezing of monolayer and suspension culture, Experimental applications- cell viability and cytotoxicity assays, clonogenic survival assays; Transformed cells- characteristics and methods. Cell transfection- methods and application. Transgenic animals- methods of production and their application.	**18Hrs**

Suggested Readings

1. Ravishankar G.A and Venkataraman L.V(1997) Biotechnology applications of Plant
2. Tissue & cell culture. Oxford & IBH Publishing co. Pvt Ltd.
3. Bhan (1998) tissue Culture, Mittal Publications, New Delhi.
4. Islan A.C (1996) Plant Tissue Culture, Oxford & IBH Publishing Co., Pvt. Ltd. Lydiane Kyte & John Kleyn (1996) Plants from test tubes. An introduction to
5. Micropropogation (3rd Edition) timber Press, Partland.
6. Kumar H.D (1991) A test book book on Biotechnology (2nd Edition). Affiliated East West
7. Press Private Ltd. New Delhi.
8. Chrispeel M.J. and Sdava D.E. (1994 Plants, Genes and agriculture, Jones and Barlett
9. Publishers, Boston.

Animal Biotechnology:

1. R. Ian Freshney. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, 7th Edition
2. Elements of Biotechnology – P.K. Gupta, Rastogi Publications.
3. John M. Davis. Animal Cell Culture: Essential Methods
4. Shivangi Mathur- Animal Cell and Tissue Culture: Agrobios (India) publication
5. Essentials of Biotechnology for Students - By Satya N. Das
6. Strategies in Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM Press 2000.
7. Practical Biotechnology – Methods and Protocols - By S. janarthanan and S. Vincent (Universities Press)
8. R.C. Dubey., A Text Book of Biotechnology. S. Chand & Co Ltd, New Delhi.

Course created by: **Approved by:**

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

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

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

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2024-25

Course Name: Food Biotechnology		**Course Code:** BBT0502T	**Year:** III	**Semester:** V
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**	30	**End Term Exam**	70
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 relationship between food, nutrition and health, to understand the principles of foods spoilage and Indian and international food safety laws and standards.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: To gain better knowledge about ingredients of food, roles of microflora in food processing. CO2: Students will learn about different food preservative techniques and harmful bacteria. CO3: Students will understand how formative foods and beverages are produced. CO4: Students will learn about Food laws and standards and quality and safety assurance of food and dairy Industries.			
Pedagogy	Interactive, discussion-based, student-centered, Presentation			
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations			

UNIT	**Topic**	**No. of Lectures**
I	Classification of food, major ingredients of food, Microbial role in food process, operation and production: new protein foods: SCP, mushroom, food yeasts, algal proteins. Food additives like coloring, flavours and vitamins.	**15 Hrs**
II	General principles underlying spoilage of foods; Microbial food poisoning and its prevention or control; Food processing and Preservation techniques. Food adulteration and contamination of food with harmful microorganisms.	**15 Hrs**
III	Organisms and their use for production of fermented foods and beverages: pickles, wine, cheese, yogurt and vinegar. Therapeutic and nutritive value of fermented products.	**15 Hrs**
IV	Food laws and standards: Indian and international food safety laws and standards; Quality and safety assurance in food and dairy industry; BIS Laboratory Services and Certification by BIS.FSSAI, HACCP- FDA.	**15 Hrs**

Suggested Readings

1. Frazier, Food Microbiology, TMH Publications.
2. May JM “Modern food microbiology”, CBS Publishers and distributors, New Delhi.
3. Heller, Genetic Engineering of Food: Detection of Genetic Modifications – WileyPublications.
4. Rehm, Biotechnolgy Set – Wiley Publications.

Course created by: **Approved by:**

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO3
IV	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: 2024-25

Course Name: Basics of Plant & Animal Science		**Course Code:** BBT0503T	**Year:** III	**Semester:** V
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**	30	**End Term Exam**	70
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 design and develop the physical laws and processes in chemistry. CO4: Students will be able to know about plant physiology and animal also.			
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. **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.	**15 Hrs**
II	**Plant kingdom:** General characters, classifications and economic aspects of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.	**15 Hrs**
III	**Animal kingdom:** General characters and outline classification of different phyla- Protozoa Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Mollusca, Arthropoda, Echinodermata, Chordates.	**15 Hrs**
IV	**Plant physiology:** Diffusion and osmosis, Water potential, Ascent of sap, Absorption of water and minerals, translocation of photoassimilates, Transpiration, physiology of stomata; Photosynthesis: Light harvesting complexes, CO_2 fixation- C_3, C_4 and CAM pathways; Plant growth hormones, their physiological	**15 Hrs**

	effects and mode of action, Photomorphogenesis- Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; Concept of photoperiodism and vernalization	

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

Course created by: **Approved by:**

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO3
IV	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: 2024-25

Course Name: Proteomics, Genomics and Metabolomics	**Course Code:** BBT0504T	**Year:** III	**Semester:** V
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**	30	**End Term Exam**	70
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 genome, nucleotide sequence, proteomics and technologies in metabolomics.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Students will be gaining in-depth knowledge about the basics of genome and techniques used. CO2: Students will be learning the different types of nucleotide sequence determination techniques. CO3: Students will understand the basic proteomics technologies are used in modern era. CO4: Students will learn the applications of technologies of metabolomics in agriculture, human health and industry.			
Pedagogy	Interactive, discussion-based, student-centered, Presentation			
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations			

UNIT	**Topic**	**No. of Lectures**
I	**Studying the Genome:** Biomarker, Genetic Mapping- Markers for Genetic Mapping; RFLP, SSLP – VNTR's, STR's, SNP's, Physical Mapping– In situ hybridization, Sequence Tagged Sites Mapping. DNA data bases.	**15Hrs**
II	**Determination of nucleotide sequence:** Chemical degradation method, Sanger's dideoxynucleotide synthetic method. Direct DNA sequencing using PCR, Sequencing by conventional shotgun method, Whole genome shot gun method, Clone Contig method.	**15Hrs**
III	**Proteomics:** Introduction to basic proteomics technology; Bio-informatics in proteomics; Proteome analysis, Proteomics classification,1D-SDS-PAGE, 2D-SDS PAGE, Detection and quantitation of proteins in gels, Pros and cons of various staining methods; Basics of mass spectrometry, MALDI- TOFF and ESI, and their application in proteomics; Tandem MS/MS spectrometry, Affinity purification of protein.	**15Hrs**
IV	**Metabolomics:** Technologies in metabolomics, Role of Spectroscopy, Electrophoretic and Chromatography techniques in metabolic profiling, Nutrigenomics, Applications of genomics and proteomics in agriculture, human health and industry.	**15Hrs**

Suggested Readings

1. Hubert Rehn, 2006 Protein Biochemistry and Proteomics -, Academic press.
2. Liebler, Humana W., 2002. Introduction to proteomics: Tools for new Biology CBS pub O'Reilly, "Developing Bioinformatics Computer Skills".
3. Griffiths JF, "An Introduction to Generic Analysis".

4. Gene Cloning and DNA Analysis: An Introduction, 6th Edition by T. A. Brown.
5. Genomics and Proteomics: Functional and Computational Aspects by Suhai.

Course created by: **Approved by:**

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

UNIT	MAPPED CO
I	CO1
II	CO2
III	CO3
IV	CO4

	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: 2024-25

Course Name: IPR Biosafety & Ethical Issues		**Course Code:** BBT0505T	**Year:** III	**Semester:** V
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**	30	**End Term Exam**	70
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 the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights, identify the significance of practice and procedure of Patents, make the students to understand the statutory provisions of different forms of IPRs in simple forms, learn the procedure of obtaining Patents, Copyrights, Trade Marks & Industrial Design and enable to keep their IP rights alive.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Distinguish and explain various forms of IPRs. CO 2: Identify criteria to fit one's own intellectual work in particular form of IPRs. CO 3: Apply statutory provisions to protect particular form of IPRs. CO4: Analyze rights and responsibilities of holder of Patent, Copyright, Trademark and Industrial Designetc. CO5: Identify procedure to protect different forms of IPRs at national and international level. CO6: Develop skill of making search using modern tools and techniques.			
Pedagogy	Interactive, discussion-based, student-centered, Presentation			
Internal Evaluation Mode	Sessional Test; Quiz; Assignments; Attendance; Presentations			

UNIT	**Topic**	**No. of Lectures**
I	**IPR:** Concept of Intellectual Property, Forms of IPR: Trade secret, Patent, Copy right, Trade mark, Industrial design, Geoghaphical indication, IPR protection and remedies licensing, Indian Patent Act 1970 (amedement 2000).	**15Hrs**
II	**Patent Laws**: International Harmonization of Patent Laws: Paris convention Treaty, WIPO, European Patent Convention, TRIPs, Protection of Biotechnological inventions, Plant Breeder's Right (PBR): Historical requirement for PBR, The extent of protection by PBR, Management of IPR, Benefit and problem from IPR.	**16Hrs**
III	**Rights/protection**: Requirement of patentable novelty, Rights/protection, infringement or violation, remedies against infringement - civil and criminal.	**13Hrs**
IV	**Biosafety:** Historical background; Introduction to biological safety cabinets; Biosafety levels; Biosafety guidelines-Government of India , Risk analysis: Risk assessment ,management and communication Containment, Planned introduction of genetically modified organism (GMOs): Budapest treaty, Biotechnology products Food and Drugs; Bioethical issues.	**16Hrs**

Suggested Readings

1. Intellectual property rights- Ganguli-Tat Mc. Grawhill. (2001) ISBN-10: 0074638602,
2. Intellectual Property Right- Wattal- Oxford Publicatiopn House.(1997) ISBN:0195905024.
3. Law and Strategy of biotechnological patents by Sibley. Butterworth publication.(2007) ISBN: 075069440, 9780750694445.
4. Thomas, J.A., Fuch, R.L. (2002). Biotechnology and safety Assessment (3rd Ed) Academic press. 9. B.D. Singh. Biotechnology expanding horizons

Course created by: **Approved by:**

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

UNIT	MAPPED CO
I	CO1, CO2, CO3
II	CO4
III	CO5
IV	CO6

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

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2024-25

Course Name: Laboratory Course V (Animal & Plant Biotechnology + Food Biotechnology Lab)	**Course Code:** BBT0506P	**Year:** III	**Semester:** V

Co-curricular/Vocational/Core/Elective: Core				
Credits: 3	**Total No. of Lectures:** NIL **Lecture-Tutorial-Practical (in hours/week) L-T-P:**0-0-6			
	Internal Continuous	30	**End Term Exam**	70
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 various procedures, protocols and techniques used in animal biotechnology, food biotechnology, and plant biotechnology experiments.			
Course Outcome	*After the successful course completion, learners will develop following attributes:* CO1: Have knowledge of the animal cell culture experiments including maintenance of various cell lines and cytotoxicity assays. CO2: Learners will get acquainted with various experiments commonly practiced in food biotech industries CO3: Students will learn the basics of plant tissue culture experiments and techniques used therein.			
Pedagogy	Interactive, discussion-based			
Internal Evaluation Mode	Sessional Test; Viva; Attendance; Lab Record			
	List of Experiments			**Practical (in Hrs)**
Plant & Animal Biotechnology Lab	1. Equipment, Glass ware, Plastic wares, Media and Reagents for Animal cell culture 2. Preparation of buffer (PBS) and Animal cells culture media and its sterilization 3. Morphological characterization of mammalian cell line under microscopy 4. Resuscitation and maintenance of mammalian cell lines. 5. Subculture of adherent mammalian cells and preservation 6. Concentration of cells in a given sample- Trypan Blue dye exclusion assay 7. Haematoxylin and eosin staining of mammalian cells. 8. Measurement of live and dead cells density by Trypan blue dye exclusion assay. 9. Determination of protein concentration by Bradford method.			**60Hrs**
Food Biotechnology	1. Determination of moisture content. 2. Determination of ash content. 3. Alcoholic fermentation. 4. Determination of Value for Acids and Content of free Fatty Acids. 5. Microbial Analysis of food samples. 6. Determine the chloride ion of unknown water sample. 7. Determination of Total Dissolved Solids, total suspended solid of water sample.			**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. H. S. Chawla "Plant Biotechnology: A Practical Approach"
7. Bhojwani and Razdan "Plant Tissue Culture"

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	√	√	√	√	√	√	√		√	√	√		√	√	√	

ERA UNIVERSITY
Department of Biotechnology
Course Outline
Academic Year: 2024-25

Course Name: Educational Visit (1 Credit) + Seminars (2 Credit)	**Course Code:** BBT0507R		**Year:** III	**Semester:** V
Co-curricular/Vocational/Core/Elective: Core				
Credits: 3	**Total No. of Lectures-Tutorial-Practical (In hours) L-T-P:**2-0-2			
Evaluation Spread	**Internal Continuous**	0	**End Term Exam**	100
Subject prerequisites	To study this subject, a student must have had biology in class 12th			
Course Objective	The main objective of this course is to provide the students an exposure to various research activities and acquaint the student with state-of-the-art technique/instruments used in various research institutions and industries of national repute. The student needs to submit a report after completion of the tour.			
Course Outcome	CO1: Develop understanding of techniques/instruments used in various reputed institutes/industries. CO2: Enhance communication and social skills by communication with peers.			
Pedagogy	Interactive, Discussion Based Sessions, Presentation			
Internal Evaluation Mode	Content: 40 Subject Knowledge: 20 Presentation: 20 Discussion: 20			

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	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√