

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Bachelor of Science	Branch/Spec.	Biotechnology	
Semester	VI	Version	1.0.0.0	
Effective from Academic Year	2015-16	Effective for the batch Admitted in	July 2013	
Subject code	BTA 601 RDT	Subject Name	R-DNA TECHNOLOGY	
Teaching scheme		Examination scheme (Marks)		
(Per week)	Lecture(DT)	Practical(Lab.)	Total	
	L TU	P TW		
Credit	03	-	03	Theory 40 60 100
Hours	03	-	03	Practical - 200 200

Pre-requisites:

Students should have basic knowledge of Recombination Technology 10+2 level

Learning Outcome:

The course will help the students to understand mechanisms and applications of Genetic engineering use in R-DNA technology

Theory syllabus

Unit	Content	Hrs
1	<p>Milestones in genetic engineering and biotechnology. Hosts E. Coli strains; Yeast (<i>Saccharomyces cerevisiae</i>, <i>Pichia pastoris</i>); Fungi (<i>Penicillium</i>, <i>Aspergillus</i>); Mammalian cell lines – names and genotypes Enzymes: Restriction modification systems: Types I, II and III. Mode of action, nomenclature. Application of Type II restriction enzymes in genetic engineering. DNA modifying enzymes and their applications: Terminal deoxynucleotidyl transferase, kinases and 2hosphatises, DNA ligases and DNA polymerases, reverse transcriptases, bacteriophage RNA polymerases, exonuclease III, BAL31, mung bean nuclease, S1 nuclease. Vectors: Definition, criteria for selection of DNA vectors, Types of vectors: plasmid vector (pBR 322), phage vector (λ), cosmid, shuttle vector-YEP & Ti plasmid. Genetic probes Oligonucleotides</p>	11
2	<p>Site-directed mutagenesis and Protein engineering. PCR based site directed mutagenesis, Random mutagenesis. Use of Phage display techniques to facilitate the selection of mutant peptides. Gene shuffling, Production of chimeric protein.</p>	11
3	<p>DNA sequencing. Chain termination, chemical cleavage and automated sequencing. Agarose gel electrophoresis, blotting techniques, dot blot and colony hybridizations. Chromosome walking and jumping. SDS-PAGE. DNA footprinting by Dnase I, DNA microarray analysis. DNA fingerprinting by RFLP and RAPD. Gel retardation assays. In situ hybridization, FISH</p>	12
4	<p>Introduction to Human gene therapy, types of gene therapy. Vectors used in Human gene therapy. Human genetic engineering, problems & ethics. Intellectual property rights and biotechnology, Ethical issues of biotechnology.</p>	12

Text Books	
1	A text book of biotechnology – R C Dubey
2	Biotechnology and genomics – P K Gupta
Reference Books	
1	Alcamo IE. (2001). DNA Technology: The Awesome Skill. 2 nd edition. Elsevier Academic Press, USA.
2	Brown TA. (2006). Gene Cloning and DNA Analysis. 5 th edition. Blackwell Publishing, Oxford, U.K.
3	Clark DP and Pazdernik NJ. (2009). Biotechnology-Appling the Genetic Revolution. Elsevier Academic Press, USA.
4	From genes to clones – Ernst winnaker
5	Genes and cloning – T A Brown
6	Glick BR and Pasternak JJ. (2003). Molecular Biotechnology. 3 rd edition. ASM Press Washington D.C.
7	Nigam A and Ayyagari A. (2007). Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw Hill, India.
8	Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7 th edition. Blackwell Publishing, Oxford, U.K.
9	Willey JM, Sherwood LM, and Woolverton CJ. (2008) Prescott, Harley and Klein's Microbiology. 7 th edition. McGraw Hill Higher Education.
Practical Content	

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme		Bachelor of Science			Branch/Spec.		Biotechnology		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2014-15		Effective for the batch Admitted in			June 2013	
Subject code		UBTA 602	Subject Name		PLANT BIOTECHNOLOGY				
		PBT							
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE		SEE	Total
	L	TU	P	TW					
Credit	03	-	-	-	03	Theory	40	60	100
Hours	03	-	-	-	03	Practical	-	-	-
Pre-requisites:									
Students should have basic knowledge of Plant Science 10+2 level									
Learning Outcome:									
The course will help the students to understand Plant tissue culture and its applications.									
Theory syllabus									
Unit	Content								Hrs
1	<p>Basic concept of plant; Monocot, Dicot, Stem, Leaf and root, General overview of Binomial nomenclature and uses of plant cell.</p> <p>Culture Media: Nutritional requirements for plant tissue culture, role of different media components, plant growth regulators, different culture media viz. MS, B5 Nitsch and White's medium.</p> <p>In-vitro methods in plant tissue culture: Explants, their cellular characteristics, dedifferentiation and redifferentiation, cellular totipotency, organogenesis and somatic embryogenesis, Micropropagation/clonal propagation.</p> <p>Organ culture: Anther & Pollen culture, ovary, ovule, embryo and endosperm culture – concept, technique, applications and limitations. Embryo rescue.</p>								11
2	<p>Plant transformation by Agrobacterium tumefaciens and A. rhizogenes. Ti plasmid. Strategies for gene transfer to plant cells. Binary and co-integrate vectors. Gene targeting in plants. Use of plant viruses as vectors (brief account only).</p> <p>Direct DNA transfer/Physical methods of gene transfer in plants - micro projectile bombardment, electroporation, liposome mediated, Calcium phosphate mediated etc.</p> <p>Genetic Markers.</p>								11
3	<p>Transgenic Plants: Introduction and applications. Developing insect resistance, bacterial and fungal disease resistance, virus resistance and abiotic stress tolerance in plants. Development of disease resistant insect resistant and herbicide resistant plants.</p> <p>GMOs: improvement of nutritional value(carbohydrates, seed storage proteins and vitamins) in plants.</p> <p>Introduction to protoplast isolation: Principles of protoplast isolation and applications, testing of viability of isolated protoplasts. Various steps in the regeneration of protoplasts.</p>								12
4	<p>Production of secondary metabolites in vitro: introduction, technique and utilities.</p> <p>Biotransformation (a brief account only).</p> <p>Plant germ plasm conservation and cryopreservation.</p>								12

	Plants as Bioreactors: antibodies, polymers, industrial enzymes. Edible vaccines. Production of Synthetic seeds	
Text Books		
1	H.S. Chawla. Introduction to Plant Biotechnology	
2	Radint and Bhojwani. Plant and tissue culture.	
Reference Books		
1	Bernard, R. Glick and Pasternak. Molecular biotechnology.	
2	Bulter and Dawson. Cell culture.	
3	Cohn and Stumph. Outline of Biochemistry, Wiley eastern.	
4	David Bourgaize. Biotechnology, Demystifying the concepts. Alp. 2000 .	
5	Dixon and Gonzales. Plant cell culture. A practical approach. IRL press.	
6	Eric. S. Grace. Biotechnology unzipped : Promises and realities.	
7	Iganacimatha. Appl. Plant Biotechnology.	
8	Iganacimatha. Basic biotechnology.	
9	K.K. De. Plant tissue culture.	
10	Miglani. Dictionary of plant genetics and molecular biology. Viva Books.	
11	Verpoorte, R. (Ed.) 2000. Metabolic engineering of plant secondary metabolism.	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Bachelor of Science				Branch/Spec.		Biotechnology	
Semester		VI				Version		1.0.0.0	
Effective from Academic Year			2014-15			Effective for the batch Admitted in			July 2013
Subject code		UBTA 603 ABT		Subject Name		ANIMAL BIOTECHNOLOGY			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE		SEE	Total
	L	TU	P	TW					
Credit	03	-	-	-	03	Theory	40	60	100
Hours	03	-	-	-	03	Practical	-	-	-
Pre-requisites:									
Students should have basic knowledge of Animal Science 10+2 level									
Learning Outcome:									
The course will help the students to understand Animal cell culture and its applications.									
Theory syllabus									
Unit	Content								Hrs
1	<p>Basic concept of animal cell, General overview of vertebrates and invertebrates, General characters of various cell: Liver, Skin and Blood and its uses.</p> <p>Animal Tissue Culture: History and Scope of Animal Tissue Culture, Culture media: Natural and chemically defined media, Serum and Serum free media, other supplements in media and their use.</p> <p>Primary cultures: Primary Cultures, Cell lines and Its Maintenance.</p> <p>Finite and Continuous cell lines, Tissue Disaggregating by Mechanical and Enzymatic methods, Sub culturing.</p>								11
2	<p>Secondary Culture – transformed animal cells and continuous cell lines.</p> <p>Organ Culture: Methods of Organ culture, utility of organ culture, Culture of adult organs.</p> <p>Cryopreservation and transport of animal tissue and cell lines.</p> <p>Bioreactors: Bioreactor for large scale culture of cells.</p>								11
3	<p>Expression vector for Animal cell.</p> <p>Expression of Cloned proteins in animal cell.</p> <p>Overproduction and downstream processing of the expressed proteins.</p> <p>Cloning : Overview, Methods of Cloning, Application and Ethics, In vitro fertilization and embryo transfer, Application.</p>								12
4	<p>Hybridoma Technology : Hybridoma and monoclonal antibodies, Production, Methods, Types of Monoclonal Antibodies & Applications.</p> <p>Vaccines: Production of Vaccines in animal Cells, Methodology, Application and limitation.</p> <p>Transgenic animals: Techniques for the production of Transgenic Mice, Fish and ship, Products produced from Transgenic Animals.</p> <p>Stem Cell Technology: Overview and Types of Stem Cell, Characteristics of Stem Cell, Application of Stem cell in Therapy</p>								12
Text Books									

1	Elements of Biotechnology: P.K. Gupta.H.S. Chawla.
2	Butler and Walter, 1997. Animal cell cultures and technology : The basics. IRL press.
Reference Books	
1	Animal cell culture : Morgan.
2	Avid Bourgaize. Biotechnology, Demystifying the concepts. Alp. 2000.
3	Babinnk and philips. 1989. Animal Biotechnology. Pergamonn.
4	Cell culture : Bulter and Dawson.
5	Das and Mookerjee. Outline of biology.
6	Eric. S. Grace. Biotechnology unzipped : Promises and realities .
7	Gibert. Developmental biology.
8	Iganacimatha. Basic biotechnology.
9	Jan kav. Introduction to Animal physiology. Viva Books.
10	Jenklus N. 1999. Animal cell biotechnology. Methods and protocols Human a press.
11	Masters JRW (ED.) Animal cell culture : A practical approach. 2000. OUP.
12	Molecular biotechnology : Bernard, R. Glick and Pasternak.
13	Roy and De. Cell biology.

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Bachelor of Science				Branch/Spec.		Biotechnology	
Semester		VI				Version		1.0.0.0	
Effective from Academic Year			2015-16			Effective for the batch Admitted in			July 2013
Subject code		UBTA 604 BPT		Subject Name		BIOPROCESS TECHNOLOGY			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE		SEE	Total
	L	TU	P	TW					
Credit	03	-	-	-	03	Theory	40	60	100
Hours	03	-	-	-	03	Practical	-	-	-
Pre-requisites:									
Students should have basic knowledge of Bioprocess 10+2 level									
Learning Outcome:									
The course will help the students to understand techniques involved in Bioprocess technology									
Theory syllabus									
Unit	Content								Hrs
1	Fermentation Product Recovery a. Criteria for choice of recovery process, b. Biomass separation from fermentation media i. Precipitation, ii. Filtration, filter aids, plate frame and rotary vacuum filters, iii. Centrifugation - Cell aggregation and flocculation, c. Cell Disruption for intracellular products , d. Solvent extraction and recovery e. Chromatography—Ion exchange, f. Membrane processes, g. Drying, h. Crystallization, i. Whole broth processing. Industrial Effluent Treatment. Fermentation Economics - Isolation, strain improvement, market potential, equipment, media, air sterilization, temperature control, aeration and agitation, recovery, water recycling, effluent treatment. Preservation of industrially important organism: Principle, methods and quality control								11
2	Quality Assurance : a. Definitions---GMP, QA, QC, b. QC of raw materials, in-process items, finished products, packaging materials, labels, c. Sterility assurance and testing, d. Microbiological Assays Bioinstrumentation – Principles, working and applications of a. Spectroscopic techniques b. Spectrophotometry (U.V., Visible, I. R) c. Fluorimetry d. Flame photometry Chromatographic techniques Radioisotopes and autoradiography								11
3	Biosensors : Principles and definition, characteristics of Ideal biosensors Immobilization: Basic concept of immobilization in biotech nology, Principles and mechanism of Immobilization, Methods of Immobilization. Bioreactor for Immobilization: Bioreactor and their Types. Synthesis of Nanomaterials by Biological methods and Applications in biotechnology								12

	and medical field	
4	<p>Enzyme Technology: Applications in therapeutic uses, Analytical uses and Industrial 12 uses.</p> <p>Commercial Products from Recombinant Microorganisms - Indigo, Melanin, Biopolymer, Polyhydroxyalkanoate, Rubber, Recombinant proteins of high value</p> <p>Intellectual Property Rights</p> <p>a. Introduction to IPR – What is intellectual property? Genesis of IPR</p> <p>b. Types of intellectual property – i. Patents ii. Copyright iii. Trademark iv. Trade secret v. Plant varieties protection act Patents – i. Patent system terminologies, ii. Categories of patents, iii. Preparation of patent</p> <p>Uses of patent system</p>	
Text Books		
1	Stanbury P. F., Whitaker A. & Hall--S. J., 1997, "Principles of Fermentation Technology", 2nd Edition, Aditya Books Pvt. Ltd, New Delhi.	
2	Casida L. E., "Industrial Microbiology" 2009 Reprint, New Age International (P) Ltd, Publishers, New Delhi	
3	H. A. Modi, 2009. "Fermentation Technology" Vols 1 & 2, Pointer Publications, India	
Reference Books		
1	Casida L E, Jr. (1968). Industrial Microbiology, Wiley Eastern Ltd, New Delhi, India	
2	Crueger W and Crueger A, (2000), Biotechnology: A Text Book of Industrial Microbiology, 2nd edn, Panima Publishing Corporation, New Delhi, India	
3	Crueger W. and Crueger A. 2000 "Biotechnology -"A Textbook of Industrial Microbiology", 2nd Edition, Panima Publishing Corporation, New Delhi.	
4	El-Mansi E M T, Bryce C F A, Dahhou B, Sanchez S, Demain A L, Allman A R (eds), (2011), Fermentation Microbiology and Biotechnology, 3rd edn, CRC Press; Taylor and Francis Group, Boca Raton	
5	Glick B.R. & Pasternak J. J., 2003, "Molecular Biotechnology, Principles and Applications of Recombinant DNA", 3rd Edition, ASM Press, Washington, USA	
6	Indu Shekar Thakur 2006 "Industrial Biotechnology" Problems and Remedies, I K International Pvt Ltd	
7	Okafor Nkuda 2007 "Modern Industrial Microbiology and Biotechnology", Science Publications Enfield, NH, USA.	
8	Peppler, H. J. and Perlman, D. (1979), "Microbial Technology". Vol 1 & 2, Academic Press.	
9	R. C. Dubey, 2005 A Textbook of "Biotechnology" S. Chand and Company, New Delhi	
10	Ratledge & B. Kristinsen 2nd edn 2006. "Basic Biotechnology". Cambridge University Press	
11	S. K. Kulkarni, Nanotechnology: Principles and Practices, Capital Publishing Co.	
12	U. Satyanarayana 2005. "Biotechnology". Books and Allied (P) Ltd 3. Agrawal A. K. and P. Parihar 2005. "Industrial Microbiology" - Fundamentals and Application AGRIBIOS (India)	
13	Waites, M J and Morgan N L, (2002), Industrial Microbiology: An Introduction, Blackwell Science	
14	Casida L E, Jr. (1968). Industrial Microbiology, Wiley Eastern Ltd, New Delhi, India	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Bachelor of Science			Branch/Spec.		Biotechnology		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2015-16		Effective for the batch Admitted in			July 2013	
Subject code		USEA 605 SBS		Subject Name		Statistics in Biological Sciences			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	-	-	-	02	Theory	40	60	100
Hours	02	-	-	-	02	Practical	-	-	-
Pre-requisites:									
Students should have basic knowledge of Statistics 10+2 level									
Learning Outcome:									
The course will help the students to understand applications of Statistics in Biological Sciences									
Theory syllabus									
Unit	Content								Hrs
1	History, Scope, Organization of Statistical Data in Biological research. Definition of research, characteristic and type of research. Collection and organization of research data.								15
2	Statistical study in biological science: Mean, Mode, Median, Standard deviation, Correlation and chisquare test. Significance and importance of statistics in biological science.								15
Text Books									
1	Biostatistics :Veerbala rastogi								
Reference Books									
1	Research Methodology: C.R.kothari								
2	Biostatistics analysis: Forrth Jerrold H zar								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Bachelor of Science			Branch/Spec.		Biotechnology		
Semester		VI			Version		1.0.0.0		
Effective from Academic Year			2015-16		Effective for the batch Admitted in			July 2013	
Subject code		UENA 606 ENG		Subject Name		ENGLISH-VI			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	-	-	-	02	Theory	40	60	100
Hours	02	-	-	-	02	Practical	-	-	-
Pre-requisites:									
Students should have basic knowledge of English Language 10+2 level									
Learning Outcome:									
The course will help the students to understand writing skill and communication skill.									
Theory syllabus									
Unit	Content								Hrs
1	Les Miserables by Victor Hugo								08
2	Les Miserables by Victor Hugo								07
3	Writing For News Papers <ul style="list-style-type: none"> ➤ Drafting News Article ➤ Press Release for College Event, University Event, ➤ Educational News 								08
4	Electronic Communication <ul style="list-style-type: none"> ➤ Participating in Telephonic Communication, ➤ Making Notes of phone calls received on behalf of others, ➤ Communicating through email, ➤ Voice Mail 								07
Text Books									
1	Text book of Business communication by Anjali Karkar and others, Orient Black Swan Publication								
Reference Books									
1	Les Miserables by Victor Hugo								
2	Business Communication by Urmila Rai and S. M. Rai								
3	Business Communication by Rodha Doctor and Aspi Doctor								

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Bachelor of Science			Branch/Spec.	Biotechnology			
Semester	VI			Version	1.0.0.0			
Effective from Academic Year		2015-16		Effective for the batch Admitted in			July 2013	
Subject code	UPBA 607 PRA		Subject Name	PRACTICAL MODULE - VI				
Teaching scheme				Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total
	L	TU	P	TW				
Credit			06		06	Theory		
Hours			12		12	Practical	--	200

Pre-requisites:

Students should have basic knowledge of Plants and Animal cell culture of 10+2 level.

Learning Outcome:

The course will help the student to understand Plant tissue culture and basic experiment used in Molecular biology.

Practical content

Content

1. Agarose Gel electrophoresis of DNA.
2. Preparation of competent cells and transformation of plasmid DNA.
3. Quantification of DNA by spectrophotometry.
4. Immobilization of enzyme
5. Sterilization and related techniques used in tissue culture.
 - Autoclaving
 - Hot Air Oven
 - Filter Sterilization
 - Surface sterilization
 - Laminar Air Flow.
7. Preparation of PTC Media and media composition.
8. Introduction of explants for Callusing.
9. Characterization of Callus.
10. Culturing of Callus.
11. Examination of Contamination in Callus
12. Isolation of genomic DNA from bacterial cells.

13. Isolation of plasmid DNA.

14. Polymerase Chain Reaction

Text Books

1 Practical Microbiology by Rakesh Patel

Reference Books

--	--