Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Science
Department of Life Science
Generic Electives (GE) Under Graduate Courses

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			-		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	-	-				
BTUG101	**GE**	**Photobiology**	60	20	20	-	-	4	-		4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. To give a general idea about Photobiology to students of all disciplines.
2. To give an idea about the role of light in life.

Course Outcomes:

1. Students will understand the role of light in basic biological functions.
2. Students will understand about radiation as a component of environment.

Unit -I

Solar Radiation – Terrestrial and Extra-terrestrial; Photoreceptors and Photo-biological responses in Plants and Animals; Absorption and Action Spectra

Unit – II

Photosynthesis – Primary Light Reactions; Photosystem I and II; Electron Transport Chain and Photophosphorylation; Calvin Cycle and Carbon Fixation in C3, C4 and CAM Plants; Photorespiration

Unit – III

Photomorphogenesis and discovery of Phytochrome; Properties and Mechanism of Phytochrome; Cryptochrome – blue light photoreceptors.

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BTUG101 Photobiology

Unit – IV

Photoperiodism and Physiology of Flowering; Circadian Rhythms and Vernalization

Vision cycle; Photoperiodism in Animals

Unit – V

Ozone hole and UV – B Radiation; Biological effects of UV – B; UV – B and Plant Metabolism; UV – B Environmental and Agricultural Importance.

BOOKS:

1. Concepts in Photobiology: Photosynthesis and Photomonogenetis.
2. Photobiology – the Science of Light and Life – Lars Olof Bjom, Springer2012.
3. Photobiology – Elli Kohe – 1995, Rene Santos, Joseph Hirschberg.
4. Textbook of Photobiology, S.R. Mishra, 2010, Discovery Publishing Pvt. Ltd.

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BTUG201	**GE**	**Microbial Analysis and its Applications**	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. To give a comprehensive idea about the important classes of microorganisms and their importance
2. To gain a fundamental and practical understanding in the use of microbiological analysis for water, food, pharmaceuticals and in environmental samples.

Course Outcomes:

1. Student will be able to understand the salient features of microorganisms, their importance in nature and their control.
2. Student will be able to show the ability to efficiently and independently use and interpret data from microbiological analysis of the given samples.

UNIT-I –Introduction to microorganisms

Discovery of microorganisms and their significance; Classification of microorganisms; General characteristics of bacteria, viruses, algae, fungi and protozoa

UNIT – II Microbial nutrition, growth and control

Nutritional classes of bacteria; Types of media and cultivation of bacteria; Factors affecting growth, Growth curve.
Control of microorganisms - Physical methods [temperature, filtration, radiation]; Chemical methods for disinfection and sanitation

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BTUG201 Microbial Analysis and its Applications

UNIT– III Methods of microbial analysis

Measurement of bacterial growth; Microbial Limit Test, Sterility Test, Bacterial Endotoxin Test, Phenol Coefficient Test, Most Probable Number, SPC, MIC, Bioassays, tests for antibacterial, antifungal and antiviral activity.

UNIT - IV Rapid methods of microbial analysis

Immunological methods; fluorescent, radio immunoassay, ELISA and nucleic acid probes and PCR (Polymerized chain reactions) and Biosensors

UNIT - V Quality Control and Quality Assurance

GMP, GLP, Validation, ISO and HACCP, FSSAI, National Standard Bodies, Testing Laboratories.

BOOKS:

1. Cappuccino, J. G., & Welsh, C. (2016). Microbiology: a Laboratory Manual. Benjamin-Cummings Publishing Company.
2. Collins, C. H., Lyne, P. M., Grange, J. M., & Falkinham III, J. (2004). Collins and Lyne's Microbiological Methods (8th Ed.). Arnolds.
3. Matthai, W., Berg, C. Y., & Black, J. G. (2005). Microbiology, Principles and Explorations. Boston, MA: John Wiley & Sons.
4. Pelczar, M. J., Reid, R. D., & Chan, E. C. (2001). Microbiology (5th Ed.). New York: McGraw-Hill.
5. Tille, P. M., & Forbes, B. A., Bailey & Scott's Diagnostic Microbiology. (2018) 14th Edition
6. Willey, J. M., Sherwood, L., Woolverton, C. J., Prescott, L. M., & Willey, J. M. (2011). Prescott's Microbiology (8th Ed, New York: McGraw-Hill.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTUG301	**GE**	**Genetically Modified Organisms**	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project/ Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. Biotechnological methods for developing Genetically Modified Organisms (GMOs).
2. Genetic Engineering – current social status.

Course Outcomes

1. Understanding the science behind GMO's.
2. Benefits and risks of GMO's.

UNIT- I: Overview of GMOs

From domestication to DNA; Crop domestication and The Green Revolution; Food evolution; Conventional and bio-food; Plant genetic engineering: Status and methods; Brief overview of GMOs; Need for GMOs; How science works; Scientific consensus.

UNIT- II: Biology behind the GMOs

Genes, genomes and genetic engineering; Diversity of genetic modification methods; New biotechnological methods: Gene editing and basic methods to isolate and manipulate genes, and transfer them into plants, animals, and microbes; Genetically modified food of plant and animal origin; Genetically modified food- pros and cons.

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GUBT301 Genetically Modified Organisms

UNIT- III: Successful and popular GMOs

Genetically modified plants and crops; Genetically modified medicines; Genetically modified animals; GMOs in commercial use, and on the horizon for use in the near to mid-term, including insect-resistant plants, herbicide-resistant crops, medicine-producing livestock, and growth enhanced fish, dietary supplements and the case of nitrite/ates; Modified agricultural practices; Deeper dive on animal biotechnology.

UNIT- IV: Challenges & Opportunities of GMOs

Environmental, health and ethical context of GMOs; Advantages of transgenic organisms; Risks associated with the creation of GMOs; Limitations of this science; Emergent and Persistent Problems; Biofortification; Potential hazards resulting from the consumption of genetically modified food by animals and the final consumer – human; How biotechnology intersects with globalization, trade, poverty, food security, and environmental sustainability.

UNIT- V: Politics and Society

Regulating GMOs; Law on GMOs; New food safety laws; Patents and intellectual property; Public vs. scientist credibility; Ethical values and perspectives; Reasons for ideological as well as legal and ecological concerns; Monsanto; The Papaya Puzzle; Forbidden Fruit; Cascade Effects; GMOs and you; Individual Choice.

BOOKS:

1. Desmond S. T. Nicholl (2008). An introduction to Genetic Engineering. (3rd Edition). Cambridge University Press.
2. Krimsky S. (2019). GMOs Decoded-A Skeptic's View of Genetically Modified Foods.
3. Parekh, Sarad R. (2004). The GMO Handbook: Genetically Modified Animals, Microbes, and Plants in Biotechnology. (1st Edition). Humana Press.
4. Watson R., Preedy V. (2015). Genetically Modified Organisms in Food. (1st Edition). Elsevier.

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BTUG401	**GE**	**Plant Tissue Culture and its Applications**	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project/ Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives

1. Students will understand the basics of plant tissue culture.
2. Understand about the laboratory organization for plant tissue culture and preparation of plant tissue culture media.
3. Knowledge about various applications of Plant Biotechnology

Course Outcomes:

1. Students will understand the techniques and acquire the knowledge for plant tissue culture.
2. Students will get insights of practical applications part of plant biotechnology which help them for career perspectives.

UNIT - I:

INTRODUCTION TO PLANT TISSUE CULTURE: Definition, brief history, principle, and significance of plant tissue culture; Cellular totipotency – Cytodifferentiation, callus and cell culture, Somatic Hybridization.

UNIT - II:

LABORATORY ORGANIZATION: Design and layout for wash area, media preparation, sterilization and storage room, transfer area for aseptic manipulations, Culture rooms, and observation/data collection areas. Labware's, Good laboratory practices, good safety practices.

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BTUG401 Plant Tissue Culture and its Applications

INSTRUMENTATION: Working principle, maintenance, and management of following instruments: Laminar air flow, autoclave, distillation unit, pH meter, orbital shaker, deep freezer, growth chamber Sterilization.

UNIT - III:

ASEPTIC TECHNIQUES: Methods of sterilization of equipment's, culture media and explants: -Washing and preparation of glassware's, packing and sterilization, media sterilization, surface sterilization, aseptic workstation, precautions to maintain aseptic conditions.

UNIT - IV:

TISSUE CULTURE MEDIA: Introduction, Types of Media, and its importance; Preparation of stocks, pH and Buffers and their significance in media. Media Constituents (Vitamins, Unidentified supplements, carbohydrate for energy source, Nitrogen source and organic supplements, complex substances, hormones, Activate charcoal)

PLANT HORMONES: Role of Plant hormones (auxins, cytokinins, abscissic acid, ethylene and Gibberellins) in plant development.

UNIT - V:

Applications of Plant Biotechnology: Micropropagation, Production of Transgenic Plants, Cryopreservation; Germ plasm conservation.

Books:

1. Altman, A., & Hasegawa, P. M. (2012). Plant Biotechnology and Agriculture. Prospects for the 21st century. (1st Ed.). Academic press.
2. Buchanan, B. B., Gruissem, W., & Jones, R. L. (2015). Biochemistry & Molecular Biology of Plants. (2nd Ed.). Chichester, West Sussex: John Wiley & Sons.
3. Chawla, H. S. (2020). Introduction To Plant Biotechnology. (3rd Ed.). International Book Distributing Company
4. Slater, A., Scott, N. W., & Fowler, M. R. (2008). Plant Biotechnology: an Introduction to Genetic Engineering. (2nd Ed.). Oxford: Oxford University Press. 7. Umesha, S. (2013). Plant Biotechnology. (1st Ed.). CRC Press.