Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	English
Course Code	AECI[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	Student should know the interpersonal skills and be an effective goal-oriented team player.			**Co-Requisite/s**	Communicative skills, workshop, Leadership development etc.			
Course Outcomes & Bloom's Level	**CO1-** Determine interpersonal skills and be an effective goal-oriented team player.**(BL1-Remember)** **CO2-** Elaborate creativity and lateral thinking.**(BL2-Understand)** **CO3-** to evaluate themselves by giving oral presentations and will receive feedback on their performances.**(BL3-Apply)** **CO4-** Paraphrase text(s) and use appropriate referencing styles**(BL4-Analyze)** **CO5-** Design and present/publish technical documents**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG5(Gender equality)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Introduction to Communication Definition, Process, Principles and Types • Forms & Grapevine Barriers & Noise	Classroom Lecture, Story telling, role play, group discussions	4
Module 2	Language Know-how Common Errors Learning through examples Functional Grammar & Contemporary usage	Classroom Lecture, Story telling, role play, group discussions	6
Module 3	Paragraph Development Techniques Principles & Methods Instruments for Cohesive Writing Creating Mind Maps/Infographic	Classroom Lecture, Story telling, role play, group discussions	8
Module 4	Writing skills Introduction to writing skills. Tone, Orientation, Attitude, Formal vs Informal, general writing, technical writing Letter/ Application/e-mail, Format, and content Indian isms in Email Writing Writing for the Web: Do's & Don'ts of Email Writing, Netiquette	Classroom Lecture, Story telling, role play, group discussions	6
Module 5	Resume Writing - Concept, types, and Application Curriculum Vitae: difference between Resume and CV Interview Skills Group Discussion and Debate	Classroom Lecture, Story telling, role play, group discussions	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Prasad, V., "Advanced Communication Skills", Atma Ram Publications, New Delhi
Articles	https://www.jetir.org/papers/JETIR2108373.pdf https://open.lib.umn.edu/communication/chapter/1-2-the-communication-process/ https://www.iosrjournals.org/iosr-jbm/papers/Vol22-issue8/Series-2/E2208024254.pdf
References Books	Madhukar, R., K, "Business Communication", Vikas Publishing House Pvt. Ltd.
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Bakery & confectionery [T]
Course Code	BSFT-0402 [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have studies Cereals, Pulses and Oilseeds in the previous semesters			**Co-Requisite/s**	Knowledge of manufacuring of bakery and confectionery products			
Course Outcomes & Bloom's Level	**CO1-** To remember the various ingredients required for bakery and processing methods of bakery and confectionery products, various product faults and their remedies**(BL1-Remember)** **CO2-** To understand the scientific principles in the processing technologies, product specification and regulations, hierarchy of bakery department and different working temperatures for bakery products**(BL2-Understand)** **CO3-** To provide students an experimental basis and a specialized knowledge and understanding in the development and quality control of bakery and confectionery products**(BL3-Apply)** **CO4-** To apply the subject knowledge in future perspectives i.e. such as in research and development in bakery products**(BL4-Analyze)** **CO5-** To evaluate the real life knowledge gained and properties and implement the same to create new bakery and confectionery products**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being)				

Part B

Modules	Contents	Pedagogy	Hours
1	Bakery industry; Current status, growth rate, and economic importance of Bakery Industry in India. Major bakery industries in India Role of Raw Materials Required for Bakery & Confectionery: Wheat flour, sugar, fat, eggs, Essential ingredients: flour, sugar, shortening, eggs, Optional ingredients: baking powder, milk, milk products, dry fruits, baking soda, dairy products, yeast etc used in bakery and confectionery. Role of yeast in bakery industry.	Lecture method, industrial visit	7
2	Small and large equipment used in manufacturing of bakery and confectionary products - Different types of ovens and other heating equipments, proofing chamber, measuring tools, Preparatory tools, mixing tools, Cutting tools, baking pans and other tools. Bread-Introduction, Types of bread, Manufacturing techniques, faults and corrective measures, Quality Characteristics.	Lecture method, Quiz, Illustrate with analogies.	8
3	Cakes: Introduction, Types of cake, Manufacturing: Sugar batter method, Flour batter method, Genoese. Blending, faults and corrective measures. Modified Bakery Products: Modification of bakery products for people with special nutritional requirements e.g., high fiber, low sugar, low fat, gluten free bakery products	Audion-video clips, Expert Lecture	10
4	Introduction to Confectionery: Scope of confectionery, Confectionery terms, technology for manufacture of flour, fruit, milk, sugar, chocolate, based confectionery products; cooler, flavor and texture of confectionery; standards and regulations	Lecture method, Audio/Video clips, group discussion, quiz	12
5	Sugar Confectionaries: Caramels, Chocolates, Fondant, Fudge, Hard candy(lollipops, jawbreakers), Jelly candies, Marshmallow, Principles of production, Quality Characteristics	Audio/Video clips, group discussion, lecture with ppt, quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the leavening action of baking powder, sodium- bicarbonate and ammonium-bicarbonate.	Experiments	BL2-Understand	2
2	Determination dough rising capacity of yeast	Experiments	BL3-Apply	2
3	Preparation of biscuits and cookies	Experiments	BL3-Apply	2
4	Preparation of bread-different types	Experiments	BL3-Apply	2
5	To identify the external and internal characteristics of bread	PBL	BL4-Analyze	3
6	Preparation of cake-different types	Experiments	BL3-Apply	2
7	Preparation of low fat cake and cookies	Experiments	BL3-Apply	2
8	Preparation of toffees	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	60	30	40	0

Part E

Books	Dubey, S. C. (1980, January 1). Basic Baking.
Articles	
References Books	Chopra, U. R. S. K. V. N. S. T. S. S. V. S. (2010, January 1). Basic Food Preparation: A Complete Manual. Manay, N. S., & Shadaksharaswamy, M. (2008, January 1). Food: Facts and Principles. New Age International. Khan, R. (2012, December 6). Low-Calorie Foods and Food Ingredients. Springer Science & Business Media.
MOOC Courses	https://nptel.ac.in/courses/126105027
Videos	https://www.youtube.com/watch?v=Dm3yP7FF4nI

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	1	1	-	1	1	-	-	3	1	1
CO2	2	2	1	1	1	-	1	1	-	1	2	-	3	2	2
CO3	2	2	2	2	1	1	-	1	-	1	-	-	3	2	2
CO4	2	2	2	1	1	-	1	1	1	1	2	-	3	2	2
CO5	3	2	2	2	1	1	1	1	1	1	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MSc_FoodTechnology

Title of the Course	Fruits and Vegetables Technology [T]
Course Code	FT-201 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Students should have a bachelor's degree in Food Technology or in any science stream. They should have received at least a 50% marks in their graduation degree.			**Co-Requisite/s**	Students should have prior knowledge of fruits and vegetables, their parts and various preservation techniques			
Course Outcomes & Bloom's Level	**CO1-** To comprehend the structure, composition, physiological development,post-harvest handling methods, processing and preservation of fruits and vegetables. **(BL1-Remember)** **CO2-** To illustrate the technology of Fruits and vegetables products like juicesand pulps, concentrates and powders, squashes and cordials, beverages, jam, jellies, sauces, etc**(BL2-Understand)** **CO3-** To describe the preservation methods and processing ways of spices develop value added products from them.**(BL3-Apply)** **CO4-** Identify the method of production of dry fruits, tea and coffee.**(BL4-Analyze)** **CO5-** To demonstrate the processing and chemical composition of cocoa beans,cocoa processing and manufacturing process for chocolate.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
1	Status of production and processing of fruits and vegetables, Structural, compositional and nutritional aspects of fruits and vegetables. Physiological development: Growth, Maturation, Ripening and Senescence,climacteric and non-climacteric fruits, Pre and post-harvest changes; pre-harvest factors affecting postharvest quality	Lecture methods,Group discussion, quiz	10
2	Selection of fruits and vegetables for processing,Techniques of processing and preservation of fruits and vegetables by refrigeration and freezing, canning and bottling, drying and dehydration,spoilage of fruits and vegetables	Lecture methods,Audio/Video clips,	10
3	Manufacturing, related calculationsand related defects ofjam, jelly, marmalade, preserve and candy; tomato puree, paste, ketchup, sauce and soup; pickles, drying/ dehydration of fruits and vegetables	Lecture methods,Audio/Video clips, group discussion,	12
4	Manufacturing and calculationsof beverages - fruit Juices, pulps, concentrates, powders, squashes, cordials and RTS, Critical points to consider in the production of different processed fruits and vegetable products and solving the associated problems	Lecture methods,Audio/Video clips, group discussion, quiz	12
5	Possible causes of post-harvest losses and conservation of fruits and vegetable. Post-harvest handling including controlled and modified storage; use of novel packaging, hypobaric storage.	Lecture methods,Audio/Video clips, group discussion,quiz	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Preservation of Fruits and Vegetables- Lal G, Siddapa GS and Tandon GL
Articles	https://ifst.onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2621.2001.00513.x
References Books	Post-harvest Technology of Horticultural Crops by Kadar AA. Preservation of Fruits and Vegetables by Lal G, Siddapa GS and Tandon GL Post-HarvestPhysiology, Handling and Utilization ofTropical and Subtropical Fruits and Vegetables by Pantastico B Storage, Processing and Nutritional Quality of Fruits and Vegetables by Salunkhe DK, Bolia HR and Reddy NR Post-Harvest Technology of Fruits and Vegetables by Thompson AK
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	2	-	-	-	-	-	1	3	1	1
CO2	3	3	2	3	2	3	1	-	-	1	1	2	3	1	1
CO3	3	3	2	2	3	3	-	-	-	-	-	-	3	1	1
CO4	3	3	2	2	2	2	-	-	-	-	-	1	3	3	3
CO5	3	3	3	3	2	2	1	-	-	-	1	1	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	HINDI I
Course Code	AEC II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	हिंदी भाषा का मूल गया ज्ञान होना आवश्यक है			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** संपर्क भाषा के रूप में हिंदी को समझना। सांस्कृतिक, एवं राष्ट्रिय एकता बनाये रखना भाषा के माध्यम से संम्भव है। पाठ्यक्रम में व्याकरण ,एवं लेखन परम्परा का बोध करना **(BL1-Remember)** **CO2-** ज्ञान को अर्थपूर्णता देने में भाषा एक सशक्त आधार है।**(BL2-Understand)** **CO3-** छात्र , भाषा को सुन कर अर्थ ग्रहण कर सकें ,शुद्ध -स्पष्ट लिख सकें एवं वक्ता के मनोभावों को समझकर भावानुभूति कर सकें। **(BL3-Apply)** **CO4-** हिंदी भाषा एवं नैतिक मूल्यों को समझना।**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	स्वतंत्रता पुकारती {कविता} ---जयशंकर प्रसाद पुष्प की अभिलाषा {कविता} --- माखनलाल चतुर्वेदी वाक्य संरचना और अशुद्धियाँ {संकलित }	lecture method, group discussion, story telling,	8
II	एक थे राजा भोज { निबंध } --त्रिभुवननाथ शुक्ल २ पर्यायवाची , विलोम , एकार्थी ,अनेकार्थी एवं शब्दयुग्म शब्द {संकलित } ३ वह तोड़ती पत्थर -सूर्यकान्त त्रिपाठी निराला ४ वर्ण -विचार {स्वर ,व्यंजन ,वर्गीकरण ,उच्चारण स्थान }	lecture method, group discussion, story telling, role play	6
III	१ भगवान् बुद्ध} { निबंध } ---स्वामी विवेकानंद २ लोकतंत्र एक धर्म है{ निबंध --डॉ सर्वपल्ली राधा कृष्णन ३ पल्लवन	lecture method, group discussion, story telling, role play	6
IV	अफसर{ निबंध -शरद जोशी २ संक्षेपण {संकलित } ३ नारीत्व का अभिशाप ४ विराम -चिह्न {संकलित }	lecture method, group discussion, story telling, role play	6
V	नैतिक मूल्य परिचय एवं वर्गीकरण{ आलेख } --डॉ शशि राय २ अंतर्ज्ञान और नैतिक जीवन{लेख --डॉ सर्वपल्ली राधाक ३ अप्प दीपोभव {लेख } -स्वामी श्रद्धा	lecture method, group discussion, story telling, role play	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	हिंदी भाषा और नैतिक मूल्य : मध्य प्रदेश शासन
Articles	https://www.cvs.edu.in/upload/IMG-20200323-WA0003.pdf
References Books	
MOOC Courses	https://onlinecourses.swayam2.ac.in/cec20_lg05/preview
Videos	https://onlinecourses.swayam2.ac.in/cec20_lg05/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	-
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Health and Wellness
Course Code	AEC-1 [T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	knowledge of concept and nature of health, wellness and its various implications			**Co-Requisite/s**	knowledge of concept and nature of health, wellness and its various implications			
Course Outcomes & Bloom's Level	**CO1-** To introduce the learners to the concept of health and wellness and its relevance in daily life. **(BL1-Remember)** **CO2-** To introduce the learners to the relation between mind-body and its relevance.**(BL2-Understand)** **CO3-** To introduce learners to health behavior and promotion of human strengths for well-being. **(BL3-Apply)** **CO4-** demonstrate adequate knowledge on well-being and promotion of healthy behavior.**(BL4-Analyze)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✓ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
1	INTRODUCTION TO HEALTH & WELLNESS -Definition of health- WHO definition; Importance of health in everyday life;Components of health- physical, social, mental, spiritual and its relevance	Lecture method	5
2	Concept of wellness;Mental Health & wellness Determinants of health behaviours Using the mass media for health promotion	Lecture method, quiz, seminar	8
3	MIND – BODY AND WELL-BEING- Mind- Body connection in health- concept and relation; pt and relation Implications of mind-body connections;Wellbeing- why it matters?	Lecture method, quiz, seminar, group discussion	8
4	Digital wellbeing; Understanding health beliefs, and perspectives of indigenous people pertaining to Assam and North East India	adudi/video lectures, seminars, expert lectures	6
5	Promoting Human strengths and life enhancement: Classification of human strengths and virtues; cultivating inner strengths: Hope and optimism	adudi/video lectures, seminars, expert lectures	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Carr, A. (2004). Positive Psychology: The science of happiness and human strength. UK: Routledge.
Articles	
References Books	Forshaw, M. (2003). Advanced psychology: Health psychology. London: Hodder and Stoughton.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	1	-	1	-	1	-	1	-	1	1	1
CO2	2	1	1	2	1	1	-	2	-	-	-	-	2	2	2
CO3	2	2	2	2	-	1	-	-	1	1	-	-	3	2	3
CO4	3	2	2	2	1	-	1	-	-	-	-	-	3	2	3
CO5	3	3	2	3	-	-	1	2	1	-	1	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	English-I
Course Code	AEC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	The students have a basic knowledge and understanding of the English language and communication.			**Co-Requisite/s**	Communication skills, Leadership development etc.			
Course Outcomes & Bloom's Level	**CO1-** Determine interpersonal skills and be an effective goal-oriented team player**(BL1-Remember)** **CO2-** Elaborate creativity and lateral thinking**(BL2-Understand)** **CO3-** Examine attitudes, emotional intelligence and understand its influence on behavior**(BL3-Apply)** **CO4-** Justify approaches to conflict resolution.**(BL4-Analyze)** **CO5-** Evaluate goal setting, management, decision-making skills.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Where the Mind is Without Fear, The Tryst with Destiny The Hero, Indian Weavers The Portrait of a Lady The Solitary Reaper	Classroom Lecture, PPts, Videoes	10
Module 2	Basic Language Skills Synonyms, Antonyms,Homonyms, Word Formation,Prefix, Suffix	Classroom Lecture, PPts,	6
Module 3	Uncountable Noun, Verb, Tense, Adverb	Classroom Lecture, PPts,	6
Module 4	Trading Comprehension, Unseen Passage	Classroom Lecture, PPts, Videos	4
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports – Printed format, Memo Format, Letter Format, Book/Letter Text Format, Layout and Structure of Reports, Components of Report Writing.	Classroom Lecture, PPts, Videos	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	C. Murallikrishna and S. Mishra (2011) Communication Skills for Engineers, Pearson education. ISBN: 9788131733844
Articles	Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
References Books	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	English-I
Course Code	AEC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	The students have a basic knowledge and understanding of the English language and communication.			**Co-Requisite/s**	Communication skills, Leadership development etc.			
Course Outcomes & Bloom's Level	**CO1-** Determine interpersonal skills and be an effective goal-oriented team player**(BL1-Remember)** **CO2-** Elaborate creativity and lateral thinking**(BL2-Understand)** **CO3-** Examine attitudes, emotional intelligence and understand its influence on behavior**(BL3-Apply)** **CO4-** Justify approaches to conflict resolution.**(BL4-Analyze)** **CO5-** Evaluate goal setting, management, decision-making skills.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Where the Mind is Without Fear, The Tryst with Destiny The Hero, Indian Weavers The Portrait of a Lady The Solitary Reaper	Classroom Lecture, PPts, Videoes	10
Module 2	Basic Language Skills Synonyms, Antonyms,Homonyms, Word Formation,Prefix, Suffix	Classroom Lecture, PPts,	6
Module 3	Uncountable Noun, Verb, Tense, Adverb	Classroom Lecture, PPts,	6
Module 4	Trading Comprehension, Unseen Passage	Classroom Lecture, PPts, Videos	4
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports – Printed format, Memo Format, Letter Format, Book/Letter Text Format, Layout and Structure of Reports, Components of Report Writing.	Classroom Lecture, PPts, Videos	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	C. Murallikrishna and S. Mishra (2011) Communication Skills for Engineers, Pearson education. ISBN: 9788131733844
Articles	Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
References Books	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Molecular Biology
Course Code	BSBT 201(T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					03	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Molecular Biology is an advance paper,therefore student must know about Gene structure and gene regulation.			**Co-Requisite/s**	Student must have background with Genetics.			
Course Outcomes & Bloom's Level	**CO1-** To understand the basic terms in contrast to genes, genome and their interactions**(BL2-Understand)** **CO2-** To identify and isolate the genomic DNA from the different samples.**(BL3-Apply)** **CO3-** To compare and analyze the different DNA present among the various samples**(BL4-Analyze)** **CO4-** To evaluate the different fragments of DNA using restriction enzymes and molecular techniques**(BL5-Evaluate)** **CO5-** To apply the understanding of biomolecules in various fields in research and development **(BL1-Remember)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Nature of gene concept, chemical nature of gene, genome, genome size, c- value paradox. Structure of DNA and their properties, A, B,C and Z types of DNA, Structure property and types of RNA, Nucleic acid as a genetic information carriers: experimental evidence	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
II	DNA replication in prokaryotes: Conservative and dispersive types, Experimental evidence for semi- conservative replication: DNA Replication: polymerase enzymes, other enzymes and protein factors involved in replication, Mechanism of replication	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
III	Transcription in prokaryotes: RNA polymerase, promoters, initiation, elongation, rho dependent and rho in dependent termination of RNA synthesis. Reverse transcription, post transcriptional processing of RNA	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	10
IV	Genetic code: basic features of genetic code, biological significance of degeneracy, wobble hypothesis, gene within gene and overlapping genes. Mechanism of translation in prokaryotes. Regulation of gene expression in prokaryotes: operon concept, lac operon, Trp operon and Ara operon.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	10
V	Mutation: Molecular basis of Mutation, Physical and chemical mutagens types of mutation, e.g. transition, transversion, frame shift, insertion, deletion, suppressor sensitive, germinal and somatic, backward and forward mutations, spontaneous and induced mutations. DNA damage and repair: types of damage (deamination, oxidative damage, alkylation and pyrimidine dimers), repair mechanism	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Qualitative test of DNA in given sample	Experiments	BL2-Understand	2
VII	To prepare standard curve of protein	Experiments	BL6-Create	2
VIII	Estimation of protein in given sample.	Experiments	BL5-Evaluate	2
IV	Quantitative test of RNA in given sample	Experiments	BL3-Apply	2
V	Spectrophotometric analysis of DNA	Experiments	BL4-Analyze	2
VI	Isolation of chromosomal DNA from E. coli cells	Experiments	BL3-Apply	2
VII	Isolation of DNA from leaves, fruits, onion etc.	PBL	BL4-Analyze	4
VIII	Quantification of DNA extracted from various samples	PBL	BL5-Evaluate	7

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Albert B;Molecular Biology of the cell James D. Watson, Tania A. Baker, Stephen;Molecular Biology of the Gene. Seventh Edition (2013).
Articles	https://www.researchgate.net/publication/378498325_Innovations_in_Molecular_Biology-Cutting-Edge_Breakthroughs_in_Molecular_Genetics
References Books	Freidfelder D;Microbial Genetics Watson and Baker ; Molecular Biology of Gene ;5th Edition lar Biology. Alberts.B, Johnson.A, Lewis.J,Molecular Biology of the Cell. Sixth Edition (2014).
MOOC Courses	Refer to Neptel Linkhttps://nptel.ac.in/courses/102103341
Videos	https://nptel.ac.in/courses/102103341

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	-	2	-	-	1	1	1
CO2	3	3	2	2	2	2	-	-	-	2	-	-	1	1	3
CO3	3	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	-	-	-	2	3	2
CO5	3	1	-	1	1	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Analytical Chemistry
Course Code	BSBT 203 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Interdisciplinary Minor							
Pre-Requisite/s	Knowledge of Fundamentals of Analytical Chemistry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic concept and principle of analytical techniques**(BL1-Remember)** **CO2-** To understand the difference between the analytical techniques**(BL2-Understand)** **CO3-** To use/apply the basic statistical treatment of the analytical data for getting a correct result and analytical methods**(BL3-Apply)** **CO4-** To Analyse Qualitative and Quantitative aspects**(BL4-Analyze)** **CO5-** To Evaluate the data obtained from the analysis**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	General purification techniques Purification of solid organic compounds, recrystallisation, use of miscible solvents, use of drying agents and their properties, sublimation. Purification of liquids. Different types of extraction: use of immiscible solvents solvent extraction, efficiency of extraction, selectivity of extraction, liquid phase and solid phase extraction systems, methods of extraction, applications. Chemical methods of purification and test of purity	Problem solving sessions, Experienced examples, Quizzes Summarizing, Leaving Questions Hand on Experience ,Tutorials	8
Module 2	Titrimetric Methods of Analysis General Introduction General principle. Types of titrations. Requirements for titrimetric Analysis. Concentration systems: Molarity, formality, normality, wt % ppm, milliequivalents and millimoles-problems Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, end point, equivalence point	Learn by doing, Simulations/ Virtual labs, Videos	8
Module 3	Chromatography, Introduction, Principle of chromatography, Classifications of chromatography, Techniques of paper and column chromatography, Thin Layer Chromatography(TLC) Partition chromatography, Ion exchange chromatography	Tutorials, Virtual labs, Demonstrations, Experiments	8
Module 4	Thermal Analysis Thermal analytical methods, principle involved in thermogravimetric analysis differential gravimetric analysis and differential scanning calorimeter, discussion of various components with block diagram, characteristics of TG and DTA, Factors affecting TG, DTA and DSC Curves	Problem solving sessions, Expeienced examples,	8
Module 5	Evaluation and procession of analytical data, Precision and accuracy, Types of errors, Normal distribution curve, Standard deviation, Confidence limit, Graphical presentation of result-method of average, Method of linear list square, Significant figures, Statistical aid to hypothesis testing: t–test & F-test, Correlation coefficient, Rejection of data	. Problem solving sessions, Expeienced examples,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Complexometric titration	Experiments	BL3-Apply	4
VIII	Qualitative Analysis using Thin Layer Chromatography	PBL	BL4-Analyze	6
IX	Purification of sample by Crystallization technique	PBL	BL6-Create	7
IV	To determine the Percentage of Copper in copper alloy solution	Experiments	BL3-Apply	2
V	To determine the percentage of Chromium in chrome alloy	Experiments	BL3-Apply	2
VI	To purify the given sample Ammonium Chloride	Experiments	BL3-Apply	
VII	Qualitative Analysis using Paper, Chromatography	PBL	BL4-Analyze	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Y Anjaneyulu Textbook of Analytical Chemistry 2008
Articles	https://nptel.ac.in/courses/104105084
References Books	Skoog D.A. and West D.M. Saunders Fundamental of Analytical Chemistry Ninth Edition
MOOC Courses	https://nptel.ac.in/courses/104105084
Videos	https://nptel.ac.in/courses/104105084

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	1	-	2	-	-	-	-	-	-	-	-	1	1	2
CO4	2	3	-	-	-	-	-	-	-	-	-	-	1	1	2
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	NCC*
Course Code	BSBT 204 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Theory only							
Course Category	Generic Elective							
Pre-Requisite/s	Should be acquainted with the basics knowledge of General Awareness about Leadership Quality, Personality Development, Defense system etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Define thinking, reasoning, critical thinking and creative thinking.**(BL1-Remember)** **CO2-** To think critically about different life related issues.**(BL2-Understand)** **CO3-** Think divergently and will try to break functional fixedness.**(BL3-Apply)** **CO4-** Creatively in their real-life problems.**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1. Personality Development-I	Thinking- Meaning and Concept of thinking, Reasoning, Process of thinking. Critical Thinking- Meaning & concept of critical thinking, Features of critical thinking, Process of critical thinking.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 2. Personality Development-II	Creative thinking- Meaning & concept of creative thinking, Features of creative thinking, Process of creative thinking, levels of Creativity, Characteristics of creative person.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 3. Leadership Development-I	Leadership capsule. Important Leadership traits, Indicators of leadership and evaluation.	Whiteboard, PPT, Video Case Study, Project Based Activity, Application Based Activity	5
Unit 4. Leadership Development-II	Motivation- Meaning & concept, Types of motivation. Factors affecting motivation. Ethics and Honor codes.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 5. Social Service and Community Development	(i) Protection of Children & Women Safety. (ii) Road/Rail Safety. (iii) New Government Initiatives. (iv) Cyber and mobile Security Awareness.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	R Gupta ; NCC National Cadet Corps A, B & C Certificate Examination Book; Ramesh Publishing House, 2018.
Articles	https://indianc.mygov.in/activity/snehahoro/article-on-ncc-camp-and-training/
References Books	Cadets training handbook common subjects (2017), D.G NCC Delhi-110030
MOOC Courses	
Videos	https://www.youtube.com/watch?v=N7nNupMdS6c

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Molecular Biology II
Course Code	BSBT 301 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic Knowledge of structure of DNA RNA gene , nucleotide and nucleoside			**Co-Requisite/s**	gain knowledge of Gene expression and there regulation system			
Course Outcomes & Bloom's Level	**CO1-** To remember the structure of biomolecules DNA, RNA & Protein**(BL1-Remember)** **CO2-** To understand DNA & RNA and its relation to the formation of Protein**(BL2-Understand)** **CO3-** To understand the importance of Molecular editing tools in the cell**(BL2-Understand)** **CO4-** To provide experimental basis, and to enable students to analyze the isolation of nucleic acid from various samples**(BL3-Apply)** **CO5-** To evaluate the applications of nucleic acid in various fields such as research and industries**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	DNA Replication: General features of chromosomal replication: DNA Replication machinery in prokaryotes and its comparison with eukaryotes, prokaryotes, Enzymology of DNA replication, Regulation of DNA replication.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Transcription in eukaryotes: Initiation, elongation and termination, Structure and function of eukaryotic/ prokryotic promoters, RNA polymerases Types and properties of transcription factors, types and properties; Enhancers/silencers structure and properties. Post transcriptional processing, Autocatalytic RNA.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Translation: Translation machinery of prokaryotes, Successive stages of protein synthesis in prokaryotes and its comparison with eukaryotes, Translational factors- Types and properties Post- translational Modification: Types and Significance.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Regulation of Gene Expression in Eukaryotes: cis – acting DNA elements; Chromatin Organization and regulation of gene expression; regulation at the level of processing of transcripts. RNA editing; Gene Alteration; DNA methylation and gene regulation; Regulation of gene expression by hormones.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	DNA libraries; Genomic and C-DNA Library, Transposable elements in prokaryotes and Eukaryotes: Types and Significance. Oncogenes and Tumor Suppressor Genes: Properties and Significance	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Isolation of Genomic DNA and restriction Digestion	Experiments	BL3-Apply	2
2	Quantitation of DNA	Experiments	BL4-Analyze	2
3	Determination of max of purified DNA fragments	Experiments	BL3-Apply	2
4	Determination of Tm of nucleic acid	Experiments	BL3-Apply	2
5	Isolation of RNA	Experiments	BL5-Evaluate	2
6	Comparative analysis of DNA isolation from different tissue of plants. Student will understand about the foundational scientific principles and findings in current molecular biology	PBL	BL4-Analyze	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Nelson, Cox and Lehninger, principles of Biochemistry, 8 edition
Articles	https://idmic.net/wp-content/uploads/2016/10/molecular-diagnostic-techniques.pdf
References Books	Arnold Berk, Chris A. Kaiser, Harvey Lodish,Molecular Cell Biology,3rd Edition
MOOC Courses	https://nptel.ac.in/courses/102103038
Videos	https://nptel.ac.in/courses/102103038

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	1	1	-	-	-	-	1	3	1
CO2	1	2	-	-	-	-	2	1	-	-	-	-	2	3	2
CO3	1	2	-	-	-	-	2	2	-	-	-	-	2	2	2
CO4	1	2	-	-	-	-	2	3	-	-	-	-	3	2	1
CO5	1	2	-	-	-	-	-3	3	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Plant tissue culture
Course Code	BSBT 302 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Should be acquainted with the basic knowledge of plants, cell biology, botany and genetics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To understand and recall the basic terms, techniques, historical landmarks of plant tissue culture**(BL1-Remember)** **CO2-** To prepare the plant tissue culture media using sterilization techniques for inoculation**(BL2-Understand)** **CO3-** To observe and differentiate the behavior of various explants towards the different types of nutrient media.**(BL4-Analyze)** **CO4-** To standardize the techniques and nutrient media for the growth and development of in vitro cultures.**(BL3-Apply)** **CO5-** To develop in vitro regenerated and transgenic plantlets using various tools and techniques of plant tissue culture.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
I	History: Important events and landmarks in the history of plant tissue culture. Introduction to cell and tissue culture, terms and definitions. Cellular Totipotency: Introduction cytodifferentiation, organ genic differentiation. Laboratory requirements and general techniques.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
II	Tissue culture media: Introduction, media constituents, types, selection, media preparation. Callus culture and its maintenance. Plant growth regulators. Cell and Suspension cultures, Somatic embryogenesis :Technique and application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
III	Micropropagation in Plants, Acclimatization : Process and challenges. Haploid production:: Anther culture and embryo culture: Introduction, techniques, culture requirements and applications. Protoplast Culture: Protoplast isolation, culture and regeneration. Soma clonal Variation	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
IV	Somatic hybridization: technique and application.. Elicitors, Secondary metabolites and their production. Cryopreservation: technique and application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
V	Plant cloning vectors and their applications. Agrobacterium mediated transformation in plants. Transgenic plants: technique and application. Application of plant tissue culture in agriculture and forestry. Concept of Intellectual property right (IPR)	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Plant tissue culture: Applications and commercial importance	Experiments	BL2-Understand	2
II	Laboratory design and set up of plant tissue culture unit.	Experiments	BL2-Understand	2
III	Preparation of culture media.	Experiments	BL3-Apply	2
IV	Surface sterilization, sealing of culture, sources of contamination and their check measures	Experiments	BL3-Apply	3
V	Sterilization of media and apparatus.	Experiments	BL3-Apply	2
VI	Collection and preparation of explants	Experiments	BL4-Analyze	2
VII	Preparation of MS media for the inoculation of seeds.	Experiments	BL3-Apply	2
VIII	To establish seeds cultures	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Razdan M.K.;An Introduction to Plant Tissue Culture;3rd Edition Smith.R, Plant Tissue Culture: Techniques and Experiments. Academic Press, 2012
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7356144/ https://link.springer.com/article/10.1007/s11627-022-10301-9
References Books	Bhojwani.S.S & Razdan.M.K;Plant Tissue Culture; 5th Edition Kole, C., Michler, C., Abbott, A.G., Hall, T.C. (Eds.) Transgenic Crop Plants: Volume 1: Principles and Development. Springer. 2010. Kole, C., Michler, C., Abbott, A.G., Hall, T.C. (Eds.) Transgenic Crop Plants: Volume 2: Utilization and Biosafety. Springer. 2010.
MOOC Courses	https://nptel.ac.in/courses/102103016
Videos	https://nptel.ac.in/courses/102103016

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	2	-	-	-	2	-	-	1	1	1
CO2	3	3	2	2	2	2	-	-	-	2	-	-	1	-	3
CO3	3	1	1	-	1	1	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	1	-	-	-	-	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	NCC*
Course Code	BSBT 304 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Theory only							
Course Category	Generic Elective							
Pre-Requisite/s	Should be acquainted with the basics knowledge of General Awareness about Leadership Quality, Personality Development, Defense system etc			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Define thinking, reasoning, critical thinking and creative thinking.**()** **CO2-** To think critically about different life related issues.**()** **CO3-** Think divergently and will try to break functional fixedness.**()** **CO4-** Creatively in their real-life problems**()** **CO5-** Understand the organizations related to disaster management and Their functioning.**()** **CO6-** Appreciate the role of NCC cadets in disaster management.**()**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1. Personality Development	(i) Group Discussions - Change your Mindset (ii) Public Speaking.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 2. Leadership Development	Case Studies – APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murthy.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 3. Disaster management	(i) Disaster Management Capsule. (ii) Organisation. (iii) Types of Disasters. (iv) Essential Services. (v) Assistance. (vi) Civil Defence Organisation.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 4. Border & Coastal Areas	History, Geography & Topography of Border/ Coastal Areas.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 5. Adventure	Adventure activities.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	R Gupta ; NCC National Cadet Corps A, B & C Certificate Examination Book; Ramesh Publishing House, 2018.
Articles	
References Books	Singh, Neeraj; A Hand Book of NCC; Kanti Prakashan Publisher
MOOC Courses	
Videos	https://www.youtube.com/watch?v=kvdDHFALpTw

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Genetic Engineering
Course Code	BSBT 401 (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have the detailed knowledge of Gene expression and hereditary information			**Co-Requisite/s**	Detailed study of genomics, proteomics and metabolomics tool			
Course Outcomes & Bloom's Level	**CO1-** To remember the role of all the enzymes used in the DNA editing**(BL1-Remember)** **CO2-** To understand the method of creating new molecules such as DNA & RNA**(BL2-Understand)** **CO3-** To understand the importance Nucleic acid editing tools**(BL2-Understand)** **CO4-** To evaluate the applications of in various fields such as research, Agriculture, Pharmaceutical industries**(BL5-Evaluate)** **CO5-** To apply the understanding of creation of new DNA , RNA & Protein and its use in different Fields.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to gene cloning and its necessity: DNA modifying enzymes: Restriction enzymes (RE)- structure function and types, polymerase, kinases, ligase, alkaline phosphatase, exonuclease etc.. Cloning methods. linkers and adaptors.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Methods of introduction of DNA into living cells, E.coli, plant and animal cells, Genetic transformation in plants:Agrobacteriun mediated transformation in plants,structure and features of Ti and Ri plasmids.Genomic libraries and cDNA libraries.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Cloning vectors: Plasmids and Bacteriophages, Phagemids, Cosmids, Artificial chromosomes (BAC and YAC) for E.coli, yeast. Strategies for identification of recombinant clones containing cloned genes: Nucleic acid hybridization, immune screening etc. Expression vectors for E.coli andYeast.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Tools for RDT: Restriction mapping, Southern and northern blotting, Forensic application of biotechnology: DNA fingerprinting and its applications, forensic medicine Molecular Pharming: Application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Applications of RDT, Production of recombinant protein (Insulin, Growth hormone), production of Recombinant vaccine. Golden rice, Artifical seed production, biofertilizers and biopesticide production GM crops and GM food	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of stock and buffer solutions for DNA isolation	Experiments	BL3-Apply	2
2	Isolation of DNA from yeast cells.	Experiments	BL3-Apply	2
3	Isolation of DNA from Plant cell.	Experiments	BL3-Apply	2
4	Isolation of plasmid DNA	Experiments	BL3-Apply	2
5	Agarose gel electrophoresis of Genomic DNA	Experiments	BL4-Analyze	2
6	Isolation of RNA	Experiments	BL4-Analyze	2
7	Quantification of DNA by spectrophotometer(260/280nm)	Experiments	BL4-Analyze	2
8	To isolate the Auxotrophic mutants from the mixed culture sample of Microorganism	PBL	BL5-Evaluate	3 days

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	TA Brown, Gene cloning 4 edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/
References Books	James D watson.Molecular Biology Of gene, 4 edition
MOOC Courses	https://nptel.ac.in/courses/102103074
Videos	https://nptel.ac.in/courses/102103074

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	2	-	-	-	-	-	-	1	-	3
CO2	1	2	3	-	-	1	-	-	-	-	-	-	1	-	2
CO3	1	2	3	-	-	-	3	-	-	-	-	-	3	1	-
CO4	1	2	3	-	-	-	-	-	-	-	-	-	2	-	-
CO5	1	2	3	-	-	2	-	-	-	-	-	-	-	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Bioprocess Engineering
Course Code	BSBT 402 (P)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	The student should have basic understanding of units, use of living organisms for the production of different metabolites			**Co-Requisite/s**	The student should have basic understanding of basic concepts of bioprocesses for the benefit of society			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Bioprocess Engineering, its applications and future prospects.**(BL1-Remember)** **CO2-** The subject Bioprocess Engineering is designed for under graduate students of biotechnology for understanding of basic concepts of each and every division of the subject along with its applications in other fields. **(BL2-Understand)** **CO3-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding.**(BL2-Understand)** **CO4-** The course aims to provide basis of analyzing the applications of Bioprocess Engineering in various fields of research and industries.**(BL3-Apply)** **CO5-** The course aims to provide basis of design, production and purification of bioproducts produced through research and in industries.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit I	Units and dimensions: dimensional analysis, stiochiometric and composition relationship, Newton's law of viscosity and its measurement. Introduction to Bioprocess technology	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-II	Kinetics of microbial growth, death and product synthesis; Air and media sterilization, Types of bioreactor. Kinetics of batch and continuous reactor.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-III	Transport phenomenon in biochemical engineering: Mass transfer, heat transfer, rheology Product recovery processes, centrifugation, chromatography, extraction process, crystallization, drying.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-IV	Microbial Production of Vitamin B12, amino acids (Glutamic acid), Microbial production of Organic acids (Citric acid), solvents (Ethanol)	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-V	Aeration and agitation, Immobilization techniques and their applications, Microbial production of food-SCP, Product recovery processes.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Media balancing experiments	Experiments	BL2-Understand	2
1	Isolation of industrially important microbes from the environment.	Experiments	BL3-Apply	2
3	Production of alcohol using different substrates and its downstream process	PBL	BL3-Apply	2
4	Microbial production of citric acid using Aspergillus niger	Experiments	BL3-Apply	2
5	Microbial production of acetic acid.	Experiments	BL3-Apply	2
6	9. Organic Solvent production	PBL	BL3-Apply	2
7	Microbial production of different biological products.	PBL	BL6-Create	30 days

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Bioprocess Engg. Principles, P.M. Doran, Elsevier
Articles	https://www.frontiersin.org/journals/bioengineering-and-biotechnology/sections/bioprocess-engineering
References Books	Principles of Fermentation Technology, Peter F. Stanbury, Allan Whitaker, Stephen Hall, Pergamon.
MOOC Courses	https://nptel.ac.in/courses/102106022 https://nptel.ac.in/courses/102106048
Videos	https://nptel.ac.in/courses/102106022 https://nptel.ac.in/courses/102106048

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	1	1	-	-	-	-	-
CO3	1	1	-	-	-	-	-	-	1	1	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	1	2	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	1	2	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Bioprocess Engineering
Course Code	BSBT 402(T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	The student should have basic understanding of units, use of living organisms for the production of different metabolites			**Co-Requisite/s**	The student should have basic understanding of basic concepts of bioprocesses for the benefit of society			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Bioprocess Engineering, its applications and future prospects.**(BL1-Remember)** **CO2-** The subject Bioprocess Engineering is designed for under graduate students of biotechnology for understanding of basic concepts of each and every division of the subject along with its applications in other fields. **(BL2-Understand)** **CO3-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding.**(BL2-Understand)** **CO4-** The course aims to provide basis of analyzing the applications of Bioprocess Engineering in various fields of research and industries.**(BL3-Apply)** **CO5-** The course aims to provide basis of design, production and purification of bioproducts produced through research and in industries.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit I	Units and dimensions: dimensional analysis, stiochiometric and composition relationship, Newton's law of viscosity and its measurement. Introduction to Bioprocess technology	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-II	Kinetics of microbial growth, death and product synthesis; Air and media sterilization, Types of bioreactor. Kinetics of batch and continuous reactor.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-III	Transport phenomenon in biochemical engineering: Mass transfer, heat transfer, rheology Product recovery processes, centrifugation, chromatography, extraction process, crystallization, drying.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-IV	Microbial Production of Vitamin B12, amino acids (Glutamic acid), Microbial production of Organic acids (Citric acid), solvents (Ethanol)	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8
Unit-V	Aeration and agitation, Immobilization techniques and their applications, Microbial production of food-SCP, Product recovery processes.	Class room teaching (chalk-board), Power Point Presentations, Online Classes, Interactive Videos	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Media balancing experiments	Experiments	BL2-Understand	2
1	Isolation of industrially important microbes from the environment.	Experiments	BL3-Apply	2
3	Production of alcohol using different substrates and its downstream process	PBL	BL3-Apply	2
4	Microbial production of citric acid using Aspergillus niger	Experiments	BL3-Apply	2
5	Microbial production of acetic acid.	Experiments	BL3-Apply	2
6	Organic Solvent production	PBL	BL3-Apply	2
7	Microbial production of different biological products.	PBL	BL6-Create	21 days

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Bioprocess Engg. Principles, P.M. Doran, Elsevier
Articles	https://www.frontiersin.org/journals/bioengineering-and-biotechnology/sections/bioprocess-engineering
References Books	Principles of Fermentation Technology, Peter F. Stanbury, Allan Whitaker, Stephen Hall, Pergamon.
MOOC Courses	https://nptel.ac.in/courses/102106022 https://nptel.ac.in/courses/102106048
Videos	https://nptel.ac.in/courses/102106022 https://nptel.ac.in/courses/102106048

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	1	1	-	-	1	2	-
CO2	2	1	-	-	-	-	-	-	1	1	-	-	1	2	-
CO3	1	1	-	-	-	-	-	-	1	1	-	-	2	1	-
CO4	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO5	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Enzymology
Course Code	BSBT 403 (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Should be acquainted with the historical aspects and concepts of enzymes and catalysis			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Student will be able to learn the major classes of enzyme and their functions in the cell**(BL1-Remember)** **CO2-** Student will understand the role of co-enzyme cofactor in enzyme catalyzed reaction**(BL2-Understand)** **CO3-** Differentiate between equilibrium and steady state kinetics and analyzed simple kinetic data and estimate important parameter (Km. Vmax, Kcat etc); **(BL2-Understand)** **CO4-** To define and describe the properties of enzymes in and regulates biochemical pathways (inhibition, allosterism)**(BL3-Apply)** **CO5-** To analyze options for applying enzymes and their inhibitors in medicine and various industries**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to enzymes. Historical aspect of enzymes. Chemical nature and properties of enzymes. Classification and nomenclature of enzymes. Enzyme Commission Number. Enzyme Models: Fischer's Lock and key and Koshland's Induced fit hypothesis. Factors affecting enzyme activity	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
II	Mechanism of enzyme action (active site, chemical modification) and regulation (Zymogens, Isozymes). Enzyme specificity, Coenzymes and Cofactors Allosterism: Allosteric regulation of enzymes, Enzyme catalysis	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
III	Enzyme Catalysis and types. Free energy of activation and effect of catalyst. Enzyme kinetics: Kinetics of enzyme catalysed Reactions: The Michaelis Menten Equation. Line Weaver Burk Plot. Significance of Km and Vmax	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
IV	Enzyme purification, Isolation of enzymes, Homogenization techniques. Purification and large-scale production of enzymes, Stable storage of enzymes.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
V	Immobilization of enzymes, Methods, Advantages and disadvantages. Applications of enzymes in food and beverage industries, leather industries, textile industries. Abzymes and Plastic enzymes	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To understand the various enzymes present in the different types of fruits and vegetbales	Experiments	BL2-Understand	3
II	To analyses the effect of substrate concentration on the enzyme activity	Experiments	BL4-Analyze	2
III	To determine the effect of temperature on the reaction rate of peroxidase enzyme	Experiments	BL5-Evaluate	2
IV	To determine the effect of pH on the reaction rate of peroxidase enzyme.	Experiments	BL5-Evaluate	2
V	To prepare the standard curve of protein using Folin Lowry method	Experiments	BL6-Create	2
VI	Immobilization of yeast cells by gel entrapment method	Experiments	BL6-Create	2
VII	To assay the activity of Urease enzyme in the legumes.	Experiments	BL5-Evaluate	2
VIII	Isolation and immobilization of various enzymes from natural resources	Internships	BL5-Evaluate	45 days

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Prasad.N.K ;Enzyme Technology: Pacemaker of Biotechnology;2nd Edition Palmer,Enzymes; Horwood Publishing Series. 2001
Articles	https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/enzyme-activity https://www.jbc.org/article/S0021-9258(20)34049-7/fulltext https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8169242/ https://pubs.acs.org/doi/10.1021/acsomega.2c07560
References Books	Biocatalysts and enzyme technology, Buchholz.K,Kasche.V, Bornscheuer.U.V, Published by Wiley-VCH, 2005. Wiseman, A: Handbook of Enzyme Biotechnology, 3rd Edition, Ellis Horwood Publication,2010 Buchholz.K,Kasche.V,Bornscheuer.U.T.;Biocatalysts and enzyme technology, Published by Wiley-VCH, 2005. Palmer.T; Enzymes: Biochemistry, Biotechnology, Clinical Chemistry ;Horwood Publishing House, Chichester, England, 2001. Bisswanger.H;Practical enzymology.. Wiley Publication. 2nd Edition, 2011
MOOC Courses	https://nptel.ac.in/courses/102103097
Videos	https://nptel.ac.in/courses/102103097

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	2	2	2	-	-	-	-	-	-	2	-	1
CO2	3	1	1	2	2	2	-	-	-	-	-	-	1	2	2
CO3	2	1	1	2	1	1	-	-	-	-	-	-	2	3	1
CO4	3	-	-	1	1	1	1	-	-	-	-	-	1	2	2
CO5	-	-	-	-	1	-	1	-	-	-	-	-	2	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	NCC*/MOOC*
Course Code	BSBT 404 (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Theory only							
Course Category	Generic Elective							
Pre-Requisite/s	Should be acquainted with the basics knowledge of General Awareness about Leadership Quality, Personality Development, Defense system etc			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Develop the qualities of social skills.**()** **CO2-** Imbibe leadership qualities. **()** **CO3-** Be motivated to serve the nation by joining Armed forces. **()** **CO4-** Contribute in environmental awareness and conservation activities**()** **CO5-** Keep abreast of current affairs & general awareness.**()** **CO6-** Effectively contribute in managing disaster relief tasks**()**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1. Personality Development	Group Discussions – Social Skills & Time management.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 2. Leadership Development	Case Studies – Case Studies – Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 war.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 3. Disaster management	(i) Initiative Trg, Organising Skills. (ii) Dos and Don'ts. (iii) Natural Disasters. (iv) Man Made Disasters. (v) Fire Services and Fire Fighting.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit-4.Environmental Awareness	Adventure Environmental Awareness and Conservation, Local and global approaches to conserve nature.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5
Unit 5. General Awareness & Armed Forces	General Awareness, Army, Navy, Air Force and Central Armed Police Forces.	Lecture, Tutorials, Group discussion, Collaborative work, self-study, Seminar presentations by students, individual and group drills, group and individual field-based assignments, Educational Excursion	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	R Gupta ; NCC National Cadet Corps A, B & C Certificate Examination Book; Ramesh Publishing House, 2018.
Articles	https://indiancc.mygov.in/
References Books	Singh, Neeraj; A Hand Book of NCC; Kanti Prakashan Publisher Cadet training hand book specialised subjects (2017)
MOOC Courses	
Videos	https://www.youtube.com/watch?v=eBA5l4iepAA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Bioinformatics
Course Code	BSBT 501 (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Should be familiar with the basics of bioinformatics, its databases and search tools, types of sequence alignment, homology modeling and evolutionary prediction of sequences.			**Co-Requisite/s**	The subject bioinformatics is designed to under graduate students of biotechnology for understanding of basic concepts of computational tools, their designing, applications, and their uses in industry and research.			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Bioinformatics, its applications and future prospects.**(BL1-Remember)** **CO2-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding**(BL2-Understand)** **CO3-** The course aims to provide basis of analyzing the applications of Bioinformatics in various fields of research and industries.**(BL3-Apply)** **CO4-** To evaluate the analytical efficiency of each algorithm**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Overview of Bioinformatics, divisions, scope, tasks and future prospects of bioinformatics, bioinformatics as multidisciplinary domain,	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-2	Databases and search tools: Types of Databases and their applications, National Centre for Biotechnology Information (NCBI), European Bioinformatics Institute (EBI), DNA Databank of Japan (DDBJ), PDB and SWISSPROT.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-3	Sequence alignment: Types of sequence alignment, Pairwise sequence alignment and its softwares, BLAST , Types and versions of BLAST, FASTA: Types and versions of FASTA	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-4	Matrices and algorithms: Dot matrix, BLOSUM, PAM, BLAST algorithm, Needlemann Wunsch algorithm, Smith Watermann algorithm, Fitch Margoliash algorithm.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-5	Multiple sequence alignment methods and its softwares, Phylogenetic prediction , Maximum parsimony method, Distance method, Maximum likelihood method	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

M

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Retrieval of DNA/ sequences from NCBI.	Experiments	BL2-Understand	2
8	Accessing protein sequence from NCBI	Experiments	BL4-Analyze	2
3.	Pairwise alignment and analysis of protein sequences using BLASTp software	Experiments	BL3-Apply	2
4.	Pairwise alignment and analysis of protein sequences using FASTA software	Experiments	BL3-Apply	2
5.	Alignment of protein sequences using dot matrix	Experiments	BL3-Apply	2
6.	Multiple sequence alignment and analysis of protein sequences using CLUSTALW software	Experiments	BL4-Analyze	2
7	Phyologenetic prediction of given set of sequences	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Introduction to bioinformatics by Cynthia Gibas
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122955/
References Books	Developing bioinformatics Skills: Hoomann H Rashidi
MOOC Courses	https://nptel.ac.in/courses/102106065 https://nptel.ac.in/courses/102106065
Videos	https://nptel.ac.in/courses/102106065 https://nptel.ac.in/courses/102106065

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	1	1	-	-	1	2	-
CO2	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO3	1	2	-	-	-	-	-	-	1	2	-	-	2	1	-
CO4	1	2	-	-	-	-	3	-	1	2	-	-	1	2	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Bioinformatics
Course Code	BSBT 501 (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Should be familiar with the basics of bioinformatics, its databases and search tools, types of sequence alignment, homology modeling and evolutionary prediction of sequences.			**Co-Requisite/s**	The subject bioinformatics is designed to under graduate students of biotechnology for understanding of basic concepts of computational tools, their designing, applications, and their uses in industry and research.			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Bioinformatics, its applications and future prospects.**(BL1-Remember)** **CO2-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding**(BL2-Understand)** **CO3-** The course aims to provide basis of analyzing the applications of Bioinformatics in various fields of research and industries.**(BL3-Apply)** **CO4-** To evaluate the analytical efficiency of each algorithm**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Overview of Bioinformatics, divisions, scope, tasks and future prospects of bioinformatics, bioinformatics as multidisciplinary domain,	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-2	Databases and search tools: Types of Databases and their applications, National Centre for Biotechnology Information (NCBI), European Bioinformatics Institute (EBI), DNA Databank of Japan (DDBJ), PDB and SWISSPROT.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-3	Sequence alignment: Types of sequence alignment, Pairwise sequence alignment and its softwares, BLAST , Types and versions of BLAST, FASTA: Types and versions of FASTA	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-4	Matrices and algorithms: Dot matrix, BLOSUM, PAM, BLAST algorithm, Needlemann Wunsch algorithm, Smith Watermann algorithm, Fitch Margoliash algorithm.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
Unit-5	Multiple sequence alignment methods and its softwares, Phylogenetic prediction , Maximum parsimony method, Distance method, Maximum likelihood method	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Retrieval of DNA/ sequences from NCBI.	Experiments	BL2-Understand	2
2	cessing protein sequence from NCBIAc	Experiments	BL3-Apply	3
3.	Pairwise alignment and analysis of protein sequences using BLASTp software	Experiments	BL3-Apply	2
4.	Pairwise alignment and analysis of protein sequences using FASTA software	Experiments	BL3-Apply	2
5.	Alignment of protein sequences using dot matrix	Experiments	BL3-Apply	2
6.	Multiple sequence alignment and analysis of protein sequences using CLUSTALW software	Experiments	BL4-Analyze	5
7	Phylogenetic prediction of given set of sequences	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Introduction to bioinformatics by Cynthia Gibas
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122955/
References Books	Developing bioinformatics Skills: Hoomann H Rashidi
MOOC Courses	https://nptel.ac.in/courses/102106065 https://nptel.ac.in/courses/102106065
Videos	https://nptel.ac.in/courses/102106065 https://nptel.ac.in/courses/102106065

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	1	1	-	-	1	2	-
CO2	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO3	1	2	-	-	-	-	-	-	1	2	-	-	2	1	-
CO4	1	2	-	-	-	-	3	-	1	2	-	-	1	2	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Cellular Metabolism
Course Code	BSBT 502 (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	Knowledge about basics of biomolecules			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To impart knowledge on structural, functional and dynamic aspects of biological components.**(BL1-Remember)** **CO2-** To comprehend the understanding of the metabolic pathways involving the four major metabolic compounds:**(BL2-Understand)** **CO3-** To estimate the relation of biological material to living matter and elaborate the structure and functions of different biomolecules.**(BL3-Apply)** **CO4-** To analyze the various biomolecules in biological samples**(BL4-Analyze)** **CO5-** To evaluate the applications of biomolecules in various fields **(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Basic Concepts of Intermediary metabolism, Carbohydrate metabolism: Glycolysis, Kreb's Cycle, glycogenolysis, glycogenesis, pentose phosphate pathway, gluconeogenesis, glyoxolate pathway, Cori cycle. Metabolic disorders	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	7
2	Biosynthesis and degradation of fatty acids, Biosynthesis of lipids, Degradation of lipids, Regulation of lipid metabolism. Formation of ketone bodies Ketosis. Metabolic disorders	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	7
3	Transamination, Oxidative deamination, decarboxylation, Biosynthesis of amino acids, Degradation of amino acids, Regulation of amino acids metabolism. Nitrogen Metabolism - Assimilation of inorganic Nitrogen sources; Urea cycle	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	7
4	Biosynthesis and degradation of purine nucleotides, Biosynthesis and Degradation of Pyrimidine nucleotide, regulation of purine and pyrimidine metabolism.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lectures	10
5	Photosynthetic microorganisms, photosynthetic pigments, and generation of reducing power by cyclic and non-cyclic photophosphorylation, Electron transport chain in photosynthetic bacteria. Carbon dioxide fixation pathways. Respiration : Components of electron transport chain, free energy changes and electron transport, oxidative phosphorylation, ATP synthase and theories of ATP formation.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Estimation of Blood Glucose by Coupled Enzyme Assay	Experiments	BL4-Analyze	3
II	Sugar Fermentation by Microorganisms	PBL	BL3-Apply	3 DAYS
III	Demonstration of Starch Digestion by Salivary Amylase	Simulation	BL2-Understand	3
IV	Isolation and Fractionation of Egg Lipids by TLC and their Estimation	PBL	BL5-Evaluate	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	David L. Nelson, Michael M. Cox, W. H. Freeman;Lehninger Principles of Biochemistry, Fifth Edition, , 2008, th Edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7545035/
References Books	G.Zubay Biochemistry 3 rd Edition Stryer Biochemistry 9 th Edition DVoet and JG. Voet , J Wiley and Sons. Biochemistry 5 th Edition David Plummer Practical Biochemistry Volume 3 Company.S;Philadelphia, Stipanuk.PA. (4th edition) (2019) Biochemical, physiological, and molecular aspects of human nutrition. Second Edition, Murray, R., Mayes, P., Rodwell, V., Granner, D (2006) Harper's illustrated biochemistry. 26th edition, McGraw-Hill Companies, Columbus, OH.
MOOC Courses	https://nptel.ac.in/courses/104105139
Videos	https://nptel.ac.in/courses/104105139

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	3	2	2	2	1	-	-	-	2	-	-	1	-	3
CO3	3	1	1	2	1	-	-	-	-	-	-	-	3	2	3
CO4	3	2	1	1	1	-	-	-	-	2	-	-	2	3	2
CO5	2	1	1	2	1	-	-	-	-	2	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Genomics & Proteomics
Course Code	BSBT 503 (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Should be acquainted with basic knowledge of genes, genomes and proteins.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To understand the fundamentals of genes, chromosomes and DNA along with their organization in the cell.**(BL1-Remember)** **CO2-** To utilize the knowledge about major genome databases, Genome analysis, Comparative genomics & Functional genomics for the preparation of genomic libraries.**(BL2-Understand)** **CO3-** To analyze the various genes isolated from different samples for their specific characteristics using various techniques.**(BL3-Apply)** **CO4-** To amplify and detect the various genes in different samples for research and development.**(BL4-Analyze)** **CO5-** To develop a genome database or purify the protein in order to develop a specific product at the commercial level**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Genome evolution and structure: Forward genetics and Reverse genetics. Genomics history, Types of genomes. Chromosomal models, Chromosome structure and organization of genome. Genome sequencing methods, Tools of genomics.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
II	Comparative Genomics: Orthologous and Paralogous genes, Speciation: Types and advantages, Genomic and c-DNA libraries, Selection and screening of gene library	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
III	Microarrays tools and analysis: Process and Application of Microarrays, DNA and RNA microarray and its differences, PCR and its variants, Real Time PCR: Probes and application, Genome annotation	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	10
IV	Genomics techniques and applications: Genetic and physical mapping: Introduction to molecular markers- Single nucleotide polymorphisms, RFLP, RAPD, AFLP, FISH for genome analysis, Human Genome Project, Pharmacogenomics: An introduction. DNA barcoding for rapid assessment of genetic diversity	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
V	Fundamentals of Proteomics: Proteomics Basics and 2D Gel Electrophoresis, Protein Identification and Analysis: Protein preparation and Separation, HRT, HART, MALDI-TOF: Instrumentation and applications	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To understand the genome organization	Internships	BL2-Understand	2
XI	Molecualr characterization of a plant using RAPD Markers	Experiments	BL4-Analyze	1 month
VI	To isolate plasmid DNA using alkaline lysis method and Quick method and its visualization by agarose gel electrophoresis	Experiments	BL5-Evaluate	5
VII	To perform restriction digestion using kit and its visualization using agarose gel electrophoresis	Experiments	BL3-Apply	5
VIII	To perform Native -PAGE.	Experiments	BL3-Apply	6
IX	To perform SDS-PAGE	PBL	BL3-Apply	6
X	Comparitive analysis of genomes of various plants and preparation of phylogentic tree	PBL	BL4-Analyze	2 months

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Gupta.P.K. ;Biotechnology and Genomics ;3rd Edition Mir.R.A. Shafi.S.M and Zargar.S.M.Principles of Genomics and Proteomics;,Elsevier;2023
Articles	https://www.frontiersin.org/articles/10.3389/fmed.2021.747333/full https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2952408/ https://www.tandfonline.com/doi/full/10.1080/13102818.2017.1400401
References Books	Twyman.R.M.;Principles of Proteomics;2nd Edition Ahmed;N;Microbial Genomics And Proteomics; 2016
MOOC Courses	https://nptel.ac.in/courses/102101072
Videos	https://nptel.ac.in/courses/102101072

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	2	2	2	-	-	-	-	-	-	2	-	1
CO2	3	1	1	2	2	2	-	-	-	-	-	-	1	1	2
CO3	2	1	1	2	1	-	2	-	-	-	-	-	3	2	1
CO4	3	1	2	1	1	-	1	-	-	-	-	-	1	3	2
CO5	1	-	-	-	1	-	1	-	-	-	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Animal Tissue Culture
Course Code	BSBT 601 (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must be aware of cell,tissues, culture media for the in vitro regeneration of cell organs.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To understand the Animal tissue culture: and how does it interact with living and non-living molecules**(BL2-Understand)** **CO2-** To Understand media constituents and media formulation strategies for mamalian cell culture.**(BL2-Understand)** **CO3-** Develop basic aseptic skills for mammalian cell culture and their applications.**(BL3-Apply)** **CO4-** To Develop proficiency in mammalian cell culture and the maintenance of cell lines.**(BL3-Apply)** **CO5-** To Apply cell and molecular techniques to in vitro situations.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✓ Environment ✓	**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
I	Introducción: History Cell culture enchiques, Equipment, and sterilization methodology. Introduction to animal cell cultures: Nutritional and physiological: Growth factors and growth parameters	Lecture methods, demonstrations, experiments, field visit, Activity based learning	8
II	Primary cell cultures, Establishment and maintenance of primary cell cultures of adherent and non-adherent cell lines, fibroblasts, endothelial cells, embryonic cell lines and stem cells. Organ culture: Methods, behavior of organ explants and utility of organ culture, whole embryo culture.	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9
III	Secondary cell cultures, Establishment and maintenance of secondary mammalian and insect cell lines, Characterization of cell lines, Karyotyping, biochemical and genetic characterization of cell lines	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	8
IV	Production of the vaccine in animal cells: use of Hybridoma for production of monoclonal antibodies.Cell cloning and selection. Transfection & transformation of cell. Commercial scale production of animal cells, stem and their application. Application of animal cell culture for in vitro testing of drugs; Testing of toxicity of environmental pollutants in cell.	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9
V	Scale-up: Scale-up in suspension: Rotating chambers; Perfused suspension cultures; Fluidized bed reactors for suspension culture.Scale-up in monolayers: Multisurface propagators; Multiarray disks, spirals, and tubes; Roller culture; Microcarriers; Perfused monolayer cultures; Membrane perfusion; Hollow fiber perfusion; Matrix perfusion; Microencapsulation; Growth monitoring	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Introdcution to animal tissue culture lab.	Experiments	BL2-Understand	2
II	Prerparation of Hank's Balanace salt solution	Experiments	BL3-Apply	2
III	To culture the animal tissue in the prpeared media	Experiments	BL3-Apply	3
IV	To check the viability of the cell and count the cell number	Experiments	BL4-Analyze	3
V	Observation of polymorpho nuclear monocytes	Experiments	BL4-Analyze	2
VI	To perform skin grafting	Internships	BL6-Create	1 month
VII	To observed the various cell lines and tissues under culture media for its growth and development	PBL	BL4-Analyze	1 week

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Freshney, Wiley-Liss,Culture of Animal Cells,5th Edition-2005
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7325846/
References Books	Culture of Animal Cells: A Manual of Basic Technique (6th Edition) R. Ian Freshney. REQUIRED. It is in your best interest to bring this book or the required chapters to class.
MOOC Courses	https://nptel.ac.in/courses/102106081
Videos	https://nptel.ac.in/courses/102106081

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	-	2	2	3	-	-	-	-	-	1	2	2
CO2	2	2	1	1	3	2	-	-	-	-	-	-	-	3	2
CO3	3	2	-	1	3	2	1	-	-	-	-	2	1	1	1
CO4	1	1	1	1	1	1	3	-	-	-	-	-	2	3	2
CO5	1	1	2	1	1	1	3	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Nanobiotechnology
Course Code	BSBT 602 (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	student should have the knowledge of biochemical molecules and there extraction , DNA RNA attachment and structures			**Co-Requisite/s**	nanomaterials and there synthesis and nanoparticle synthesis			
Course Outcomes & Bloom's Level	**CO1-** To Remember the Basis and History of Nanobiotechnology**(BL1-Remember)** **CO2-** To understand and apply the working principles of nanostructures.**(BL2-Understand)** **CO3-** To apply the uses of nanostructures in Biological cells and its product**(BL3-Apply)** **CO4-** To identify the application of nanosystem**(BL4-Analyze)** **CO5-** To develop an biotechnological application in health, medicine & environment**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Development of nanobiotechnology - timelines and progress, overview. Fundamentals of Nanoscience & Nanotechnology Introduction, classifications and definition	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Types of nanomaterials and their classifications (1D, 2D and 3D) Nanocrystal, Nanoparticle, Nano tubes,Quantum dot, Quantum Wire and Quantum Well	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Properties & characterization of nanomaterials -Optical (UV-Vis/Fluorescence) X-ray diffraction Imaging and size (Electron microscopy, light scattering) Biosensors: different classes - molecular recognition elements, transducing elements.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Applications of Nano-Materials in Biosystems Nanomaterials and Diagnostics/Drug Delivery. Biological nanoparticles production - plants and microbial. Nano materials and Toxicity Evaluation Cyto-toxicity, Geno-toxicity In vivo tests/assays etc.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Nanobiotechnological applications in health and disease - infectious and chronic. Nanobiotechnological applications in Environment and food - detection and mitigation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Synthesis Methods of Nanomaterials	PBL	BL6-Create	1 week
II	Metal Nanoparticles : Synthesis of plasmonic silver nanoparticles	PBL	BL6-Create	1 week
III	Characterization of nanoparticles	Internships	BL4-Analyze	15 DAYS

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Tuan Vo-Dinh Nanotechnology in Biology and Medicine: Methods, Devices, and Applications. 4rd Edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9865684/
References Books	Christof M.Niemeyer, Chad A. Mirkin,Wiley VCH. 1 Nanobiotechnology: Concepts,Applications and Perspectives (2004) 3rd Edition 2. Chad A.Mirkin and Christof M. Niemeyer (Eds), Wiley VCH. Nanobiotechnology - II more concepts and applications. (2007) 4rd Edition
MOOC Courses	https://nptel.ac.in/courses/118107015
Videos	https://nptel.ac.in/courses/118107015

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	1	-	-	-	-	-	-	-	2	-	3
CO2	1	2	3	2	2	2	1	-	-	-	-	-	1	2	3
CO3	1	2	3	2	-	2	1	-	-	-	-	-	2	3	3
CO4	1	2	3	3	2	1	-	-	-	-	-	-	1	3	3
CO5	1	2	-	3-	2	1	-	-	-	-	-	-	1	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Drug designing
Course Code	BSBT 701 (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	The students will be highly motivated to this branch of biotechnology and will be acquainted with the different drug design processes, strategies to design and develop some important industrial lead molecules.			**Co-Requisite/s**	The students should be familiar with the basics of drug design, its databases, softwares, strategies adopted for drug design as well as the different methods used for drug design			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Drug Discovery**(BL1-Remember)** **CO2-** They understand the different CADD techniques and their applications**(BL2-Understand)** **CO3-** The course provides various strategies to design and develop new drug like molecules **(BL3-Apply)** **CO4-** They becom e aware about the working with molecular modeling softwares to design new drug molecules **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction to Drug Discovery and Development: Stages of drug discovery and development Lead discovery and Analog Based Drug Design Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation	lecture method, collaborative learning, Field visits, ABL	8
Unit-II	Quantitative Structure Activity Relationship (QSAR) SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determibation of physicochemical parameters such as partition coefficient. Hammet's substitution constant and Tafts steric constant , 3D QSAR approaches like COMFA and COMSIA	lecture method, collaborative learning, Field visits, ABL, softwares, PBL	8
Unit-III	Molecular Modeling and virtual screening techniques Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening, Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. De novo drug design.	lecture method, collaborative learning, Field visits, ABL, softwares, PBL	8
Unit-IV	Informatics & Methods in drug design Introduction to Bioinformatics, Chemoinformatics, ADME databases, chemical, biochemical and pharmaceutical databases	lecture method, collaborative learning, Field visits, ABL, softwares, PBL	8
Unit-V	Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.	lecture method, collaborative learning, Field visits, ABL, softwares, PBL	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Stages of drug discovery	Case Study	BL2-Understand	2
2	Analog based drug design and its applications	Case Study	BL2-Understand	2
3	Quantitative structure activity relationship (QSAR)	Case Study	BL3-Apply	2
4	Methods of drug design	Case Study	BL3-Apply	2
5	Molecular modeling approaches	Case Study	BL3-Apply	2
6	Molecular Docking	Case Study	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	1. Computational and structural approaches to drug discovery, Robert M Stroud and Janet.F Moore, RCS Publishers. 2. Introduction to Quantitative Drug Design by Y.C. Martin, CRC Press, Taylor & Francis group.
Articles	https://onlinecourses.niptel.ac.in
References Books	1. Drug Design by Ariens Volume 1 to 10, Academic Press, 1975, Elsevier Publishers. 2. Principles of Drug Design by Smith and Williams, CRC Press, Taylor & Francis. 3. The Organic Chemistry of the Drug Design and Drug action by Richard B. Silverman, Elsevier Publishers.
MOOC Courses	https://onlinecourses.niptel.ac.in https://nptel.ac.in/courses/102106070
Videos	https://nptel.ac.in/courses/102106070 https://onlinecourses.niptel.ac.in

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	-	-	-	-	-	-	-	-	-	1	2
CO2	1	2	2	1	-	-	-	-	-	-	-	-	-	1	1
CO3	1	1	2	2	-	-	-	-	-	-	-	-	-	3	1
CO4	1	2	1	2	-	-	-	-	-	-	-	-	-	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Research Methodology
Course Code	BSBT 702 (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have some basic knowledge of statistics			**Co-Requisite/s**	Should have understanding of the basic concepts of different types of research and their purposes			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Research Methodology, its applications in experimental design and future prospects.**(BL1-Remember)** **CO2-** The subject Research Methodology is designed for post graduate students of Biotechnology for describing the basic concepts of each and every division of the subject along with its applications in other fields.**(BL2-Understand)** **CO3-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding of data and its applications in experimental verification**(BL2-Understand)** **CO4-** The course aims to provide basis of analyzing the applications of Research Methodology in various fields of research and industries.**(BL3-Apply)** **CO5-** The course aims to provide basis of experimental design, computer applications and use of statistical tools in research and industries.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Definition of Research, Qualities of Researcher, Components of Research Problem, Various Steps in Scientific Research, Types of Research; Hypotheses Research Purposes - Research Design - Survey Research, Research Reports.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Data Collection: Sources of Data: Primary Data, Secondary Data; Procedure Questionnaire - Sampling Merits and Demerits - Experiments - Kinds - Procedure; Control Observation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Introduction to Statistics - Probability Theories - Conditional Probability, Point and Interval Estimates of Means and Proportions; Hypothesis Tests, One Sample Test - Two Sample Tests / Chi-Square Test, t-test - Standard deviation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Statistical Applications: Analysis of Variance, Completely Randomized Design, Randomized Complete Block Design, Latin Square Design	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Report Writing, Computer application: Use of computers for preparing and presenting Documents. Appropriate Statistical and other relevant packages, internet .Use of MS-Office	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Steps in scientific research methodology	Case Study	BL2-Understand	2
2	Sampling process	Case Study	BL2-Understand	2
3	Developing Hypothesis	Case Study	BL2-Understand	2
4	Data collection	Case Study	BL3-Apply	2
5	Analysis of Variance	Case Study	BL3-Apply	2
6	Randomized Block Design	Case Study	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Research methodology, C. R. Kothari, 6th Edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5037945/
References Books	Research methodology, Panneerselvam, R., Prentice Hall of India, New Delhi
MOOC Courses	https://nptel.ac.in/courses/121106007
Videos	https://nptel.ac.in/courses/121106007

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	1	2	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO3	1	2	-	-	-	-	-	-	1	2	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Proteomics and Protein Interaction
Course Code	BSBT 801 (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must be aware with the proteins, their sturcture and fucntions and protein isolation techniques			**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
I	An introduction to proteomics: Basics of protein structure and function, An overview of systems biology, Evolution from protein chemistry to proteomics	Lecture methods, demonstrations, experiments, ABL, PBL	8
II	Abundance-based proteomics: Sample preparation and prefractionation steps, Gel-based proteomics - two-dimensional gel electrophoresis (2-DE), two-dimensional fluorescence difference in-gel electrophoresis (DIGE), Staining techniques	Lecture methods, demonstrations, experiments, ABL, PBL	8
III	Short-range interactions, electrostatic forces, van der waal interactions, hydrogen bonds, Hydrophobic interactions., Mass Spectrometry,	Lecture methods, demonstrations, experiments, ABL, PBL	8
IV	Mass spectrometry based methods for protein identification. De Novo sequencing using mass spectrometric data. HRT and HART.	Lecture methods, demonstrations, experiments, ABL, PBL	8
V	Protein interactions: Yeast -two hybrid method,GFP Tags, proteome wide interaction maps,Analysis of protein structures and sequence data,Application of proteomics to health and agriculture	Lecture methods, demonstrations, experiments, ABL, PBL	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To study the protein structures and function	Experiments	BL2-Understand	2
II	Isolation of proteins	PBL	BL3-Apply	7
III	To perform protein interactions using homology modeling	PBL	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Genes IX by Benjamin Lewin, Johns and Bartlett Publisher, 2006 Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition
Articles	https://archive.nptel.ac.in/courses/102/105/102105089/
References Books	Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001. Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.
MOOC Courses	https://archive.nptel.ac.in/content/syllabus_pdf/102101082.pdf https://archive.nptel.ac.in/courses/102/105/102105089/
Videos	https://archive.nptel.ac.in/courses/102/105/102105089/ https://archive.nptel.ac.in/content/syllabus_pdf/102101082.pdf

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Animal Diversity
Course Code	BSBT GE I [T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	Based on Animal Diversity classication taxonomy so create basic knowladge of animal identification and classification.			**Co-Requisite/s**	Create basic platform to all other animal based subject/course.			
Course Outcomes & Bloom's Level	**CO1-** To describe general taxonomic rules on animal classification**(BL1-Remember)** **CO2-** To understand the taxonomy of invertebrates and vertebrates animals, their affinities and their association with evolution and phylogeny.**(BL1-Remember)** **CO3-** To understand the importance of kingdom Animalia and its applications**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to basic concept of classification and animal identification**(BL4-Analyze)** **CO5-** To evaluate the applications of taxonomy in various fields such as research and development.**(BL5-Evaluate)** **CO6-** To apply the understanding of animal diversity in identification of animals and their phylogeny in organic evolution**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	Principle and Concepts of Taxonomy. Characteristics & classification of non-chordates phylums up to sub-classes according to Parker and Haswell. Chordata: Classification of Phylum up to order according to Parker and Haswell	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Phylum –Protozoa, porifera, and Coelentarata Type study of paramecium and plasmodium Protozoa and human diseases type study of Sycon and type study of Obelia.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Phylum platyhelminthes and Nemetahelminthes Annelida- Type study of Taenia, Ascaris and Nereis Phylum Arthropoda: Type study of Prawn Economic importance of insects social insects & their life cycle.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Phylum Mollusca and Echinodermata Type study of Pila External Features of star fish different larva of Echinodermata	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Hemichordate- External features and affinities of Balanoglossous. Urochordata- Type study of Herdmania (excluding Development). Cephalochordate- Type study of Amphioxus. Affinities of Amphioxus.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Identification of & taxonomy of animals	Field work	BL2-Understand	8
VII	To collect the local vertebrate fauna and study them.: This project will help in understanding the vertebrates and their varieties	PBL	BL4-Analyze	8
3	Identification of Helminthes and annelids	Experiments	BL4-Analyze	4
4	Identification of Molluscan and arthropods	Experiments	BL4-Analyze	4
5	Identification of echonoderms and vertebrates	Experiments	BL5-Evaluate	8
VI	To collect the local Invertebrate fauna and study them.: This project will help in understanding the invertebrates and their varieties.	PBL	BL4-Analyze	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	0

Part E

Books	Text Book of Zoology by: S. Chand
Articles	https://www.nature.com/articles/ncomms12718
References Books	Unified Zoology by: V.K. Tiwari Invertebrate and Vertebrate zoology by: Veerbala Rastogi
MOOC Courses	https://nptel.ac.in/courses/102104042
Videos	https://nptel.ac.in/courses/102104042

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	2	2	-	-	-	-	-	-	-	1	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	2	2	3
CO3	1	2	2	1	1	-	-	-	-	-	-	-	2	1	3
CO4	1	2	2	3	1	-	-	-	-	-	-	-	1	1	2
CO5	1	2	3	1	3	-	-	-	-	-	-	-	1	1	2
CO6	1	2	-	-	2	-	-	-	-	-	-	-	-	2	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Plant Ecology
Course Code	BSBT GE II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Generic Elective							
Pre-Requisite/s	Understand plant communities and ecological adaptations in plants			**Co-Requisite/s**	The interactions among plants and between plants and other organisms.			
Course Outcomes & Bloom's Level	**CO1-** Understand plant communities and ecological adaptations in plants **(BL1-Remember)** **CO2-** Learn about biodiversity and its conservation **(BL2-Understand)** **CO3-** Study botanical regions of India and different vegetation types.**(BL3-Apply)** **CO4-** Understand bioremediation, global warming and climate change**(BL4-Analyze)** **CO5-** The interactions among plants and between plants and other organisms.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG5(Gender equality)				

Part B

Modules	Contents	Pedagogy	Hours
1	Concept of ecology. Approaches to ecology: its main divisions & development facets. Relation to other sciences. Ecology in India. Man-Environment relationship.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Environment factors, Climatic factors: Composition and stratification of atmosphere, global climate, precipitation temperature, light, wind. Topographic factors, Edaphic factors (soil): Biotic factors: Interaction between plants and animals, positive and negative interactions, alleopathy.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	7
3	Levels of Organisation, Population and Communities: concepts of autecology, synecology; concept of biological diversity; habitat and ecological niche. Distribution and characteristics of populations; population dynamics; Ecological Speciation. Ecotone and edge effect; methods of studying vegetation; dynamics of communities; plant succession, processes, type; primary and secondary succession; climax concepts.	Tutorials, Collaborative, Demonstrations, Project methods Experiments, field work	8
4	Ecosystems: Structure, biotic and the abiotic components, trophic organization, source of energy, autotrophy, heterotrophy, parasitism; food chains and webs; ecological pyramids. Energy flow; principles, grazing and detritus food chains, models of energy flow; ecosystem productivity, Measurement of productivity & ecological efficiencies. Biogeochemical cycles; dynamics: hydrologic cycle & gaseous cycles.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Diversity of Ecosystems: Aquatic: fresh water (lotic and lentic), marine (Pelagic and benthic) estuarine: major terrestrial biomes: tundra, temperate and tropical. Principles of phytogeography; phytogeogarphical divisions of India.Endemism; hotspots, Vegetation of Gwalior. Conservation of natural resources. Wild Life Management.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Analysis of soil: 1. pH 2. organicmatter 3. Water holdingcapacity, 4. Texture ofsoil.	Experiments	BL2-Understand	2
3	Study of vegetation by quadrat: 8. Frequency, 9. density 10. Abundance. 11. Minimum size of quadrat	Experiments	BL2-Understand	2
2	Analysis of water: 5. Turbidity, 6. conductivity, 7. Dissolved Oxygen.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut
Articles	https://academic.oup.com/jpe
References Books	Singh, J.S. singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publications, NewDelhi
MOOC Courses	https://nptel.ac.in/courses/109105203
Videos	Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth System Approach.Oxford.

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	1	2	1	2	3	-	-	-	-	-	-	2	1	1
CO3	1	2	1	1	2	1	3	-	-	-	-	-	3	2	1
CO4	1	1	1	1	1	3	-	-	-	-	-	-	3	1	1
CO5	2	2	2	2	1	3	3	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Organic Chemistry
Course Code	BSBT GE III (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Interdisciplinary Minor							
Pre-Requisite/s	Students should know the basic principles of chemistry			**Co-Requisite/s**	Students must know the basic chemical reactions of organic compounds			
Course Outcomes & Bloom's Level	**CO1-** To remember the Stereochemistry and reaction mechanism of organic compounds**(BL1-Remember)** **CO2-** To understand the basic principles of Chemistry**(BL2-Understand)** **CO3-** To apply the basic chemical test on natural organic compounds**(BL3-Apply)** **CO4-** To analyze the presence of functional groups in an organic compounds**(BL4-Analyze)** **CO5-** To evaluate the applications of organic reactions mechanisms in preparation of various industrial products like pharmaceutical agents, Paints , Synthetic dyes etc**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕			**SDG (Goals)**	SDG4(Quality education)			

Part B

Modules	Contents	Pedagogy	Hours
Unit -I	Effects and Stereochemistry: Electronic effects (resonance, inductive, hyperconjugation) and steric effects and its applications (acid/base property); optical isomerism in compounds with and without any stereocenters (allenes, biphenyls); conformation of acyclic systems (substituted ethane/n-propane/n-butane) and cyclic systems (mono- and di-substituted cyclohexanes).	lecture method, collaborative learning, Field visits, ABL	8
Unit -II	Chemistry of Intermediate and Synthetic Applications-I: Chemistry of reactive intermediates (carbocations, carbanions, free radicals, carbenes, nitrenes, benzynes etc ...); Hofmann-Curtius-Lossen rearrangement, Wolff rearrangement, Simmons-Smith reaction, Reimer-Tiemann reaction, Michael reaction, Darzens reaction, Wittig reaction and McMurry reaction	lecture method, collaborative learning, Field visits, ABL	8
Unit -III	Chemistry of Intermediate and Synthetic Applications-II: Pinacol-pinacolone, Favorskii, benzilic acid rearrangement, dienone-phenol rearrangement, Baeyer-Villiger reaction; oxidation and reduction reactions in organic chemistry; organometallic reagents in organic synthesis (Grignard, organolithium and organocopper); Diels-Alder, electrocyclic and Sigmatropic reactions; functional group inter-conversions and structural problems using chemical reactions	lecture method, collaborative learning, Field visits, ABL	8
Unit -IV	Natural Products Chemistry: Chemistry of alkaloids, steroids, terpenes, carbohydrates, amino acids, peptides and nucleic acids.	lecture method, collaborative learning, Field visits, ABL	8
Unit -V	a)Aromatic and Heterocyclic Chemistry: Monocyclic, bicyclic and tricyclic aromatic hydrocarbons, and monocyclic compounds with one hetero atom: synthesis, reactivity and properties. b) Applications of Artificial Intelligence in Organic Chemistry Introduction of AI, AI in Organic Industry, Knowledge-based Expert System in an organic chemistry Industry, Fuzzy Logic Technique in Industry, ANN Technique in the FoIndustry, Machine Learning Techniques	lecture method, collaborative learning, Field visits, ABL	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit - I	To check the presence of Carbohydrates in various organic products	Experiments	BL3-Apply	2
Unit -II	To check the presence of Proteins in various food products	PBL	BL3-Apply	2
Unit -III	To check the presence of Lipids/Fats in various food products	Experiments	BL3-Apply	2
Unit -IV	To separate Casein protein from milk sample	PBL	BL4-Analyze	4
Unit -V	To separate Nicotine from dry tea leaves	PBL	BL4-Analyze	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	0

Part E

Books	Reaction mechanism in organic Chemistry;O.P. Agarwal
Articles	Laboratory Techniques in Organic Chemistry ;A.I.Vogel
References Books	Advanced Organic Chemistry; Jerry March
MOOC Courses	https://nptel.ac.in/courses/104103111
Videos	https://nptel.ac.in/courses/104101115

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	3	-	-	-	-	-	-	-	1	2	2
CO2	2	2	1	3	2	-	-	-	-	-	-	-	1	1	1
CO3	1	2	3	2	2	-	-	-	-	-	-	-	1	2	2
CO4	2	2	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	2	1	3	3	2	-	-	-	-	-	-	-	1	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Inorganic Chemistry
Course Code	BSBT GE III (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Interdisciplinary Minor							
Pre-Requisite/s	Knowledge of coordination bonding in complexes, Transition elements their properties			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember Knowledge of Transition elements, Acids and Bases, Oxidation and reduction, Complexes , Lanthanides, Actinides**(BL1-Remember)** **CO2-** To understand Properties and uses of Transition elements, Coordination compounds, Acids and Bases , Non aqueous solvents Lanthanides, Actinides**(BL2-Understand)** **CO3-** To Apply the Transition elements, Complexes, Lanthanides, Actinides in the different application**(BL3-Apply)** **CO4-** To Analyze the Structure , Bonding ,Magnetic Properties of Transition elements, Complexes**(BL4-Analyze)** **CO5-** To Evaluate the results analyzed**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Chemistry of Elements of First Transition Series: Characteristic properties of d-block elements Properties of the elements of the first transition series, their binary compounds such as Carbides, Oxides and Sulphides Complexes illustrating relative stability of their oxidation states, co-ordination number and geometry	Stoy telling activity Mnemonics Experienced examples, Quizzes Summarizing, PPT's	8
Module 2	UNIT – II: Chemistry of Elements of second and Third Transition Series: General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry	Mnemonics , Experienced examples, , Videos , PPT's	8
Module 3	UNIT – III: A. Co-ordination Compounds Werner's co-ordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of co-ordination compounds, isomerism in co-ordination compounds, valance bond theory of transition metal complexes theory of transition metal complexes B. Oxidation and Reduction Use of redox potential data: analysis of redox cycle, redox stability in water: Frost, latimer and Pourbaix diagrams, Principles involved in the extraction of elements	Demonstrations, Videos, PPT's Virtual labs Group discussions	8
Module 4	Chemistry of Lanthanide Elements Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. B. Chemistry of Actinides General features and chemistry of actinides, chemistry of separation of Np. Pu and Am from U, similarities between the later actinides and the later lanthanide	Interactive videos PPT's Experienced examples	8
Module 5	UNIT – V A. Acids and Bases Arrhenius, Bronsted- Lowry, the Lux-Flood, solvent system and lewis concepts of acids and bases B. Non-aqueous Solvents Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH3 and liquid SO2.	Interactive videos , PPT's Experienced examples, Seminar	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module 3	Synthesis of Complex and Double salt	PBL	BL3-Apply	6
Experiment	To determine Acid Radical Nitrate Sulphate	Experiments	BL3-Apply	2
Experiment	To determine Acid radical Sulphide Nitrite	Experiments	BL3-Apply	2
Experiment	To determine th Basic Radical Group Zero	Experiments	BL3-Apply	2
Experiment	To determine the Basic Radical Group One	Experiments	BL3-Apply	2
Experiment	To determine Basic Radical Group 2	Experiments	BL3-Apply	2
Experiment	To determine the Basic Radical Group 3	Experiments	BL3-Apply	2
Experiment	o determine the Basic Radical Group 4	PBL	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	M.N.N Tandon Unified Chemistry 2010
Articles	
References Books	J.D.Lee Concise Inorganic Chemistry Fifth edition
MOOC Courses	https://nptel.ac.in/courses/104101093
Videos	https://nptel.ac.in/courses/104101093

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	3	3	2	-
CO2	3	2	1	-	-	-	-	-	-	-	-	3	3	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	2	2	1	-
CO4	2	3	1	-	-	-	-	-	-	-	-	1	1	2	-
CO5	2	2	2	-	-	-	-	-	-	-	-	1	1	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Organic Chemistry
Course Code	BSBT GE III (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Students should know the basic principles of chemistry			**Co-Requisite/s**	Students must know the basic chemical reactions of organic compounds			
Course Outcomes & Bloom's Level	**CO1-** To remember the Stereochemistry and reaction mechanism of organic compounds**(BL1-Remember)** **CO2-** To understand the basic principles of Chemistry**(BL2-Understand)** **CO3-** To apply the basic chemical test on natural organic compounds**(BL3-Apply)** **CO4-** To analyze the presence of functional groups in an organic compounds**(BL4-Analyze)** **CO5-** To evaluate the applications of organic reactions mechanisms in preparation of various industrial products like pharmaceutical agents, Paints , Synthetic dyes etc**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕			**SDG (Goals)**	SDG4(Quality education)			

Part B

Modules	Contents	Pedagogy	Hours
Unit -I	Effects and Stereochemistry: Electronic effects (resonance, inductive, hyperconjugation) and steric effects and its applications (acid/base property); optical isomerism in compounds with and without any stereocenters (allenes, biphenyls); conformation of acyclic systems (substituted ethane/n-propane/n-butane) and cyclic systems (mono- and di-substituted cyclohexanes).	lecture method, collaborative learning, Field visits, ABL	8
Unit -II	Chemistry of Intermediate and Synthetic Applications-I: Chemistry of reactive intermediates (carbocations, carbanions, free radicals, carbenes, nitrenes, benzynes etc ...); Hofmann-Curtius-Lossen rearrangement, Wolff rearrangement, Simmons-Smith reaction, Reimer-Tiemann reaction, Michael reaction, Darzens reaction, Wittig reaction and McMurry reaction	lecture method, collaborative learning, Field visits, ABL	8
Unit -III	Chemistry of Intermediate and Synthetic Applications-II: Pinacol-pinacolone, Favorskii, benzilic acid rearrangement, dienone-phenol rearrangement, Baeyer-Villiger reaction; oxidation and reduction reactions in organic chemistry; organometallic reagents in organic synthesis (Grignard, organolithium and organocopper); Diels-Alder, electrocyclic and Sigmatropic reactions; functional group inter-conversions and structural problems using chemical reactions	lecture method, collaborative learning, Field visits, ABL	8
Unit -IV	Natural Products Chemistry: Chemistry of alkaloids, steroids, terpenes, carbohydrates, amino acids, peptides and nucleic acids.	lecture method, collaborative learning, Field visits, ABL	8
Unit -V	a)Aromatic and Heterocyclic Chemistry: Monocyclic, bicyclic and tricyclic aromatic hydrocarbons, and monocyclic compounds with one hetero atom: synthesis, reactivity and properties. b) Applications of Artificial Intelligence in Organic Chemistry Introduction of AI, AI in Organic Industry, Knowledge-based Expert System in an organic chemistry Industry, Fuzzy Logic Technique in Industry, ANN Technique in the FoIndustry, Machine Learning Techniques	lecture method, collaborative learning, Field visits, ABL	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit - I	To check the presence of Carbohydrates in various organic products	Experiments	BL3-Apply	2
Unit -II	To check the presence of Proteins in various food products	PBL	BL3-Apply	2
Unit -III	To check the presence of Lipids/Fats in various food products	Experiments	BL3-Apply	2
Unit -IV	To separate Casein protein from milk sample	PBL	BL4-Analyze	4
Unit -V	To separate Nicotine from dry tea leaves	PBL	BL4-Analyze	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Reaction mechanism in organic Chemistry;O.P. Agarwal
Articles	Laboratory Techniques in Organic Chemistry ;A.I.Vogel
References Books	Advanced Organic Chemistry; Jerry March
MOOC Courses	https://nptel.ac.in/courses/104103111
Videos	https://nptel.ac.in/courses/104101115

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	3	-	-	-	-	-	-	-	1	2	2
CO2	2	2	1	3	2	-	-	-	-	-	-	-	1	1	1
CO3	1	2	3	2	2	-	-	-	-	-	-	-	1	2	2
CO4	2	2	2	3	3	-	-	-	-	-	-	-	1	2	3
CO5	2	1	3	3	2	-	-	-	-	-	-	-	1	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Plant Physiology
Course Code	BSBT GE IV (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Generic Elective							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic concepts and view of physiology of plants**(BL1-Remember)** **CO2-** To understand the mechanisms of photosynthesis, photophosphorylation and Light and dark reactions.**(BL1-Remember)** **CO3-** To describe the mechanism of active and passive adsorption**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyze the mechanism of plant respiration and different pathways**(BL4-Analyze)** **CO5-** To evaluate the growth and development of different plants across geological periods.**(BL5-Evaluate)** **CO6-** To apply the understanding of growth and development and nutrition system in plants**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Water Relations: Importance of water to plants, Permeability – related theories, diffusion, osmosis, imbibition, plasmolysis, and mechanism of absorption – (active and passive). Ascent of sap. Transpiration, kinds of transpiration, mechanisms of transpiration. Mechanisms of Stomatal movement, plant Anti Transpirants, guttation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
II	Photosynthesis: Photosynthetic pigments, mechanisms of photosynthesis, photophosphorylation, Light and dark reactions, C3 (Calvin cycle), C4 (Hatch and Slack cycle), Factors affecting the rate of photosynthesis	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
III	Respiration: Significance of respiration, types of respiration, respiration quotient, Aerobic and Anaerobic respiration, Glycolysis, Kreb's cycle, Electron transport system. Oxidative phosphorylation, pentose phosphate pathway. Factors affecting the rate of respiration.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
IV	Mineral nutrition – Essential micro and macro nutrients, role of essential elements, their deficiency and toxicity symptoms. Assimilation of mineral nutrients. Stress physiology: Plant responses to water stress, temperature stress, and salt stress.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
V	Growth and Development: Phases of growth and kinetics of growth Plant movement. Photoperiodism. Senescence, vernalization. Seed dormancy, phytochrome and plant nutrients. Organic translocation: phloem sap, P-protein, phloem loading and unloading, mass flow hypothesis and its critical evaluation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To demonstrate the process of osmosis (Potato and Egg. Membrane)	Experiments	BL2-Understand	2
II	To demonstrate the process of Plasmolysis	Experiments	BL4-Analyze	2
III	To prove that chlorophyll, light and CO2 are necessary for photosynthesis	PBL	BL4-Analyze	5
IV	Experiment to show anaerobic respiration.	PBL	BL4-Analyze	8
V	To determine the value of R. Q.	Experiments	BL4-Analyze	2
VI	To demonstrate the process of transpiration among green plants.	Case Study	BL4-Analyze	5
VII	Enzymes specificity: effect of temperature, heavy metals.	PBL	BL5-Evaluate	5 days

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	20	40	

Part E

Books	1. Hopkins, W.G. and Huner, P.A. 2008 Introduction to Plant Physiology. John Wiley and Sons.
Articles	https://www.nature.com/subjects/plant-physiology
References Books	2. Nelson, D.L., Cox, M.M. 2004 Lehniger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA. 3. Salisbury, F.B. and Ross, C.W.1991 Plant Physiology, Wadsworth Publishing Co. Ltd. 4. Taiz,L. and Zeiger, E. 2010 Plant Physiology, 5th edition, Sinauer Associates Inc. MA,USA.
MOOC Courses	https://nptel.ac.in/courses/102107075
Videos	https://nptel.ac.in/courses/102107075

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	3	-	-	-	-	-	-	-	-	2	3	3
CO2	1	1	2	2	1	2	1	-	-	-	-	-	2	3	2
CO3	1	3	2	2	2	3	1	-	-	-	-	-	3	2	2
CO4	1	3	2	2	2	2	2	-	-	-	-	-	3	1	1
CO5	3	3	1	1	1	1	2	-	-	-	-	-	3	2	1
CO6	1	-	-	1	-	-	-	-	-	-	-	-	-	-	2

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Animal Physiology
Course Code	BSBT GE IV (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Generic Elective							
Pre-Requisite/s	basic concepts of physiology and the organ systems physiology of animals determine and understand working and functioning of different systems with their anatomical and biochemical aspects describe the system physiology of mammals			**Co-Requisite/s**	Relate with organic mechanisms in biology			
Course Outcomes & Bloom's Level	**CO1-** To describe fundamental knowledge of animal physiology**(BL1-Remember)** **CO2-** To understand the detailed concepts of digestion respiration excretion the functioning of nerves and muscles Hormones and reproduction**(BL2-Understand)** **CO3-** To understand the importance of Physiology and its applications**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to basic concept of physiology**(BL4-Analyze)** **CO5-** To evaluate the applications of Physiology in various fields such as research and development as well as in various industries**(BL5-Evaluate)** **CO6-** To apply the understanding of Physiology in their future perspective fields i.e. Medical and clinical, Pathological, drug industries etc. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	Animal Nutrition- Nutrients and their Functions Physiology of Digestion Hormonal control of digestion absorption of Food and disorders.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Physiology of Respiration in Mammals Respiratory Pigments Regulation of Respiration Osmo-regulation in animals. Circulatory System: Heart Cardiac Cycle Blood pressure Blood Vessels ECG – its principle and significance	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Immune System In Mammals : An overview. Excretory System & Physiology of Excretion in Mammals Counter current theory Thermoregulation in Animals Hibernation Aestivation.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Nervous tissue- Structure, Properties Function and Physiology of nerve Impulse Conduction EEG: its principle and significance Muscular Tissue -Types structure Muscular Physiology Chemical Changes during muscular physiology	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Endocrine gland- Pituitary gland Thyroid and Parathyroid gland Adrenal gland Thymus gland Pancreas and other glands Mechanism of Hormonal action Physiology of Reproduction in mammals	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Spotting vis permanent slides of digestivesystem and experiments based onmetabolism	Experiments	BL2-Understand	8
VI	Detection of Carbohydrates, Protein and fats in given samples	PBL	BL4-Analyze	6
III	determination of Blood group Bloodpressure and study of Immune organs	Experiments	BL4-Analyze	4
IV	Spotting Muscular and nervouse tissue	Experiments	BL2-Understand	4
V	Study of harmonal action and study ofgonads	Experiments	BL4-Analyze	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Prasad.N.K ;Enzyme Technology: Pacemaker of Biotechnology;2nd Edition Palmer;Enzymes; Horwood Publishing Series. 2001
Articles	https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/enzyme-activity https://www.jbc.org/article/S0021-9258(20)34049-7/fulltext https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8169242/ https://pubs.acs.org/doi/10.1021/acsomega.2c07560
References Books	Biocatalysts and enzyme technology, Buchholz.K;Kasche.V, Bornscheuer.U.V, Published by Wiley-VCH, 2005. Wiseman, A: Handbook of Enzyme Biotechnology, 3rd Edition, Ellis Horwood Publication,2010 Buchholz.K;Kasche.V;Bornscheuer.U.T.;Biocatalysts and enzyme technology, Published by Wiley-VCH, 2005. Palmer.T; Enzymes: Biochemistry, Biotechnology, Clinical Chemistry ;Horwood Publishing House, Chichester, England, 2001. Biswanger.H;Practical enzymology.. Wiley Publication. 2nd Edition, 2011
MOOC Courses	https://nptel.ac.in/courses/102103097
Videos	https://nptel.ac.in/courses/102103097

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	2	2	2	-	-	-	-	-	-	2	-	1
CO2	3	1	1	2	2	2	-	-	-	-	-	-	1	2	2
CO3	2	1	1	2	1	1	-	-	-	-	-	-	2	3	1
CO4	3	-	-	1	1	1	1	-	-	-	-	-	1	2	2
CO5	-	-	-	-	1	-	1	-	-	-	-	-	2	-	1
CO6	-	2	-	-	1	-	-	-	-	-	-	-	1	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	General and comparitive anomtomy of vertebrates
Course Code	BSBT GEII (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Generic Elective							
Pre-Requisite/s	Should be acquainted with the basics knowledge of Principle of Anatomy and histology of chordate Zoology			**Co-Requisite/s**	create basic knowladge about physiology GEIV-A			
Course Outcomes & Bloom's Level	**CO1-** To describe basic concepts of anatomy and anatomical structure of the organs of animals.**(BL1-Remember)** **CO2-** To understand the Anatomy, histology, and comparative anatomy in different vertebrates**(BL2-Understand)** **CO3-** To understand the importance of Anatomy and its applications**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to acquire a specialized knowledge and understanding in advanced the field of Anatomy and histology**(BL4-Analyze)** **CO5-** To evaluate the applications of genetics in various fields such as research and development, medical science genetic engineering etc**(BL5-Evaluate)** **CO6-** To apply the understanding of analysing the applications of Anatomy and histology in various fields such as research and industries**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG5(Gender equality)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to General Anatomy Animal Tissues - Epithelium Connective tissue skeletal tissue circulatory tissue and nervous tissue	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Structure of Heart of mammals Structure of Brain Sense organs & their Structure Skeletal system Blood vessels, Mammals Kidney and Reproductive organs of mammals	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Comparative account of integument of vertebrates (Amphibia Reptiles Birds and Mammals) Comparative account of Digestive system of Vertebrates (Amphibia Reptiles Birds and Mammals) Comparative account of limb bones and girdles of vertebrates Amphibia Reptiles Birds and Mammal	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Comparative account of Respiratory system of Vertebrates (Amphibia Reptiles Birds, and Mammals) Comparative account of Brain vertebrates (Amphibia Reptiles Birds and Mammals)	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Comparative account of Aortic & Heart of vertebrates (Amphibia Reptiles Birds and Mammals). Comparative account of urinogenital system of vertebrates (Amphibia Reptiles Birds & mammals).	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Spotting: based on histology	Experiments	BL2-Understand	8
2	Spotting: Visceral Organs	Experiments	BL2-Understand	8
3	Study of human visceral organs as per syllabus	Experiments	BL4-Analyze	4
4	Osteology and study of fethers	Experiments	BL4-Analyze	4
5	Study of organ system	Experiments	BL5-Evaluate	4
VI	Determination of Blood group and ABH factor in own blood sample	PBL	BL4-Analyze	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	60	

Part E

Books	Jordan E.L. & Verma P.S. (2003). Chordate Zoology. S. Chand & Company Ltd. New Delhi. Chaki K.K. Kundu G. & Sarkar S. (2005). Introduction to General Zoology. Vol. 1. New Central Book. Agency (P) Ltd. Kolkata B.D.Chaurasia: handbook of General Anatomy Parker T. J. & Haswell W. (1972). Text Book of Zoology Volume II: Marshall and Willam (Eds.) 7th Ed. Macmillan Press London
Articles	https://www.nature.com/articles/152088a0
References Books	G.J.Tortora & N.P.anagnostakos: Principal of aaanatomy and Physiology
MOOC Courses	No courses found for given search
Videos	https://www.google.com/search?sca_esv=e2da69de12d3bb4c&sca_upv=1&rlz=1C1NMEO_enIN999IN999&q=General.+Anatomy+in+animals&tbm=vid&source=lnms&prmd=ivsnbmtz&sa=X&ved=2ahUKEwiklbTtjlqGAxVw8jgGHU1kBEoQ0pQJegQIDBAB&biw=1366&bih=625&dpr=1#fpstate=ive&vld=cid:bbd064e4,vid:T8pCS4rdm38,st:0

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	2	2	-	-	-	-	-	-	-	1	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	2	2	3
CO3	2	2	2	1	1	-	-	-	-	-	-	-	2	1	3
CO4	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2
CO5	1	2	1	1	2	-	-	-	-	-	-	-	1	1	2
CO6	1	2	2	-	-	-	-	-	-	-	-	-	-	-	2

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Biostatistics & Computer applications
Course Code	BSBT SEC III (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Skill Enhancement Courses							
Pre-Requisite/s	Understanding of basic concepts of Computers, operating systems, their designing, and applications of Biostatistics in research and development.			**Co-Requisite/s**	Basic concepts of Biostatistics and Computer Applications, its applications and future prospects in research and analysis using statistical tools.			
Course Outcomes & Bloom's Level	**CO1-** The course prepares the student to understand the basic concepts of Fundamentals of Biostatistics and Computer Applications, its applications and future prospects**(BL1-Remember)** **CO2-** The subject Fundamentals of Biostatistics and Computer Applications is designed for under graduate students of biotechnology for understanding of basic concepts of each and every division of the subject along with its applications in other fields. **(BL2-Understand)** **CO3-** The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding**(BL2-Understand)** **CO4-** The course aims to provide basis of analyzing the applications of Fundamentals of Biostatistics and Computer Applications in various fields of research and industries.**(BL3-Apply)** **CO5-** The course aims to provide basis of experimental design, computer applications and use of statistical tools in research and industries.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Computer Systems – Basics of Computer Systems, various Hardware Components – Data Storage and various Memory Units – Central Processing Unit, Introduction to Software and its life cycle.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	DOS, MS-Offices and its application, Operating System: types of operating system, application, process and its characteristics. WWW, web browser, E-mail.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	DOS, MS-Offices and its application, Operating System: types of operating, Topologies & Technologies – LAN, WAN, MAN,PAN, Wireless LAN.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Introduction to Biostatistics ,common terms ,notions and Applications, Statistical population and Sampling Methods,Classification and tabulation of Data, Diagrammatic and graphical presentation,Frequency Distribution, Measures of central value,Measures of variability; Standard deviation, standard Error, Range, Mean Deviation, Coefficient Variation, Analysis of variance.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Basic tests, tests of significance, t-test, chi-square test, Regression , Basis of regression, regression analysis, Estimation, testing, Prediction, Checking residual analysis. Multivariate Analysis. Design of Experiments, randomization, replication, local control, complementary randomized, randomized block design	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Methods of Sampling	Case Study	BL2-Understand	2
2	Diagrammatic and graphical presentation of data	Case Study	BL3-Apply	2
3	Calculation of Standard deviation	Case Study	BL5-Evaluate	2
4	Analysis of variance	Field work	BL3-Apply	2
5	Tests of significance: t-test	Case Study	BL3-Apply	2
6	Tests of significance: Chi Square test	Case Study	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	20
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0		0		0

Part E

Books	Computer fundamentals, P.K. Sinha
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3469943/
References Books	Working in MS- Office, Ron Mansfield, TMH
MOOC Courses	https://nptel.ac.in/courses/102101056
Videos	https://nptel.ac.in/courses/102101056

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO2	1	2	-	-	-	-	-	-	1	1	-	-	2	1	-
CO3	1	2	-	-	-	-	-	-	1	1	-	-	1	2	-
CO4	1	2	-	-	-	-	-	-	1	2	-	-	2	1	-
CO5	1	2	-	-	-	-	-	-	1	2	-	-	1	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Bioethics and Biosafety
Course Code	BSBT SEC IV

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Skill Enhancement Courses							
Pre-Requisite/s	scientific communication approaches for Bioethics and Biosafety			**Co-Requisite/s**	concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).			
Course Outcomes & Bloom's Level	**CO1-** To remember the basic concepts and view of professional and scientific communication approaches for Bioethics and Biosafety **(BL1-Remember)** **CO2-** To understand the Introduction to science, technology and society, issues of access-Case studies/experiences from developing and developed countries. Ownership, monopoly and an environmental sustainability, public vs. private funding, biotechnology in international relations, globalization and development and their analysis.**(BL2-Understand)** **CO3-** To describe comprehensive understanding of Challenges for the Indian Biotechnological research and industries Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International.**(BL3-Apply)** **CO4-** To provide Theoretical basis,and to enable students to analyze the basic concepts of the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP). Cartagena Protocol for biosafety **(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviors that foster positive and productive interactions in diverse bioterrorism and convention on biological weapons. Social and ethical implications of biological weapons settings **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Biotechnology And Society: Introduction to science, technology and society, issues of access-Case studies/experiences from developing and developed countries. Ownership, monopoly, traditional knowledge, biodiversity, benefit sharing, environmental sustainability, public vs. private funding, biotechnology in international relations, globalization, and development divide.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	6
2	Public acceptance issues for biotechnology: Biotechnology and hunger: Challenges for the Indian Biotechnological research and industries Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Biosafety– Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP). Cartagena Protocol for biosafety	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	6
4	Biosafety assessment procedures in India and abroad. International dimensions in biosafety, bioterrorism, and convention on biological weapons. Social and ethical implications of biological weapons.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	6
5	Principles of bioethics: Legality, morality and ethics, autonomy, human rights, beneficence, privacy, justice, equity etc. The expanding scope of ethics from biomedical practice to biotechnology, bioethics vs. business ethics	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Thomas J.A.-Biotechnology and Safety Assessment Thomas J.A., Fuch R.L Academic Press 3rd Edition 2002-ASM Press 3rd. ed. 2000
Articles	https://www.ndcebios.in/v1n1/2021010110.pdf https://www.researchgate.net/publication/353346609_ON_BIOETHICS_AND_BUSINESS_ETHICS
References Books	Fleming D.A., Hunt D.-Biological safety Principles and practices-ASM Press 3rd. ed. 2000
MOOC Courses	https://nptel.ac.in/courses/109106092
Videos	https://nptel.ac.in/courses/109106092

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	3	3	3	1	2	3	1	3	2	3
CO2	1	1	2	3	1	3	3	3	2	1	3	2	1	1	2
CO3	3	3	2	1	3	3	3	2	1	1	3	2	2	3	2
CO4	3	3	3	3	2	2	3	3	1	1	3	2	3	3	2
CO5	3	3	2	2	1	3	3	3	1	1	3	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Disaster Management
Course Code	BSBT VAC III

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Community Enganement and Service							
Pre-Requisite/s	To be familiar with the basics of natural disasters as well as anthropogenic factors and various approaches for disaster managements.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To learn types of disasters and its profile in India**(BL1-Remember)** **CO2-** To understand the causes and impacts of disasters on environment and related case studies of Global and National disasters.**(BL2-Understand)** **CO3-** To learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.**(BL3-Apply)** **CO4-** To understand the concept of Disaster Management Cycle and its Risk Reduction Measures**(BL4-Analyze)** **CO5-** To apply the National Acts and policies for mitigating disasters, Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land) SDG17(Partnerships for the goals)				

Part B

Modules	Contents	Pedagogy	Hours
1	Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity buildings) Factors of disasters, Global trends in disaster: urban disasters, pandemics, complex emergencies, Climate change	lecture method, collaborative learning, group dicussions, field visit,	8
2	Classification of disaster: geophysical, hydrological, climatological, meteorological, biological and technological or man-made hazards. Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.	lecture method, collaborative learning, group dicussions, field visit,case studies	8
3	Disaster management cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA).	lecture method, collaborative learning, group dicussions, field visit,case studies	8
4	Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources	lecture method, collaborative learning, group dicussions, field visit,case studies	8
5	Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, Environmental Legislation for Disaster Risk Management in India. Role of information technology in protecting environment and health. Role of NGOs Cases Studies: Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, South India Tsunami, Bihar floods, Plague Surat, COVID-19 pandemic	lecture method, collaborative learning, group dicussions, field visit,case studies	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Contemporary Disaster Issues in India & World	Case Study	BL4-Analyze	4
2	Disaster Mitigation Methods & Involvement of Technologies	Seminar	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	• Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423 • Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361] • Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 • Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010. • Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3105552/
References Books	• Coppola P Damon, 2007. Introduction to International Disaster Management, Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. • Cuny, F. 1983. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development 2002. • Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009. National Disaster Management Policy. • Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012. • Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 • National Institute of Disaster Management • National Disaster Management Authority • http://nidm.gov.in, http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini
MOOC Courses	https://nptel.ac.in/courses/124107010
Videos	https://nptel.ac.in/courses/124107010

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	3	3	3	1	2	3	1	3	2	3
CO2	1	1	2	3	1	3	3	3	2	1	3	2	1	1	2
CO3	3	3	2	1	3	3	2	1	1	3	2	2	3	2	2
CO4	3	3	3	3	2	2	3	3	1	1	3	2	3	3	2
CO5	3	3	2	2	1	3	3	3	1	1	3	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Environemental Issues and Sustainable Development
Course Code	BSBT VAC IV

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Community Enganement and Service							
Pre-Requisite/s	Basic Knowledge of Environmental Issues and Sustainable Development			**Co-Requisite/s**	Goals and Targets of Sustainable Development Goals. Strategies for the implementation of Sustainable Development goals			
Course Outcomes & Bloom's Level	**CO1-** CO1. To develop sentiments and sensitize them towards environmental challenges and concept of sustainable development.**(BL2-Understand)** **CO2-** CO2. To acquire analytical skills/methods in assessing environmental impacts through a multidisciplinary approach;**(BL4-Analyze)** **CO3-** CO3. Ability to design sustainability performance metric to assess the impact on community's sustainable development**(BL5-Evaluate)** **CO4-** CO4. Acquire expertise and skills to evaluate feedback systems that can readjust the pathways of processes and procedures to ensure success in implementing sustainable development initiatives.**(BL1-Remember)** **CO5-** CO5. Students acquire skills to communicate, prepare, plan and implement the sustainable development project to achieve milestone of SDGs.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG5(Gender equality) SDG12(Responsible consuption and production) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
1	History and emergence of the concept of Sustainable Development, Environmental issues and crisis, Resource degradation, greenhouse gases and Effects, desertification, social insecurity, Industrialization, Globalization and Environment. Dimensions of Sustainable Development, Principles of Sustainable Development.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, discussion (questions & answers section)	8
2	Sustainable Development Goals: Capacity Building for Sustainable Environment, Sustainable Land Management. Global and regional progress on SD, Individual and collective actions for SD, Sustainable Mountain development, Clean air for Climate Mitigation and Human Health, Sustainable Corporate Practices, Sendai Framework for Disaster Risk Reduction, Conservation and Management of Global Forest Ecosystem	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
3	Society, environment, culture and economy; current challenges - natural, political, socio-economic imbalance; sustainable development initiatives and policies of various countries: global, regional, national, local; needs of present and future generation - political, economic, and environmental.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
4	GSD-2019, GSD 2023. Implementation Progress: SDG Progress report, Sustainability and development indicators and SDGs, UN's outlook of sustainable development and efforts	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures,Audio/Video clips, Group discussion.	8
5	Case Studies & Projects on Rural Sustainable Development (Indian village perspectives) - Village resources (broad perspectives); current challenges and thematic areas; village social hierarchy; village economy; needs of present and future generation; conflicts - sustainability and rural culture & tradition; road to achieving sustainable development goals - bridging conflicts and way forward.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion. Field visits. Industrial Visit (MSW/BMW/STP/ETP)	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Sustainable development aims to use natural resources and the environment to raise the standard of living while preserving future generations' capacity to meet their own needs	PBL	BL3-Apply	2 MONTHS
II	Analyze the current situation to identify specific challenges and opportunities in the targeted area or community in order to Assess environmental, economic, and social factors.	Internships	BL4-Analyze	1 MONTHS
III	Monitor energy production and savings, and assess environmental impact.	Field work	BL4-Analyze	1 MONTHS
IV	Plan a community solar farm where residents can buy or lease solar panels	Field work	BL3-Apply	2 MONTHS

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson. 2. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, Weir Publisher (ELBS) 3. William P.Cunningham and Mary A. (2015) Cunningham Environmental Science: A Global Concern, Publisher (Mc-Graw Hill, USA)
Articles	1. Nhamo, Godwell, and Vuyo Mjimba. Sustainable Development Goals and institutions of higher education. Springer, 2020. 2. Bell, Simon, and Stephen Morse. Sustainability indicators: measuring the immeasurable?. Routledge, 2012. 3. Sørensen, Bent. Energy, Resources and Welfare: Exploration of Social Frameworks for Sustainable Development. Academic Press, 2016. 4. Dent, David, Olivier Dubois, and Barry Dalal-Clayton. Rural planning in developing countries: supporting natural resource management and sustainable livelihoods. Routledge, 2013. 4. Sala, Serenella, Biagio Ciuffo, and Peter Nijkamp. "A systemic framework for sustainability assessment." Ecological Economics 119 (2015): 314-325.
References Books	1. Elliott, Jennifer. 2012. An Introduction to Sustainable Development. 4th Ed. Routledge, London. 2. Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. "An introduction to sustainable development." (2012).
MOOC Courses	https://nptel.ac.in/courses/109106200
Videos	https://nptel.ac.in/courses/109106200

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-1	3	2	-	-	-	1	-	1	-	-	-	2	2	3
CO2	1	3	2	-	-	-	2	-	1	-	-	-	1	2	3
CO3	3	2	1	-	-	-	3	-	2	-	-	-	1	2	-
CO4	2	3	1	-	-	-	3	-	2	-	-	-	-	3	1
CO5	2	3	1	-	-	-	3	-	3	-	-	-	1	-	-
CO6	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Fundamentals of Biochemistry
Course Code	BSBT101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Knowledge about basic chemistry and science			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the structure of various biomolecules like carbohydrates, fats, amino acids, etc**(BL1-Remember)** **CO2-** To comprehend the biological material; and its relation to living matter and elaborate the structure and functions of different biomolecules**(BL2-Understand)** **CO3-** To understand the importance of biophysical chemistry and its applications.**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyze the various biomolecules in food samples.**(BL4-Analyze)** **CO5-** To evaluate the applications of biomolecules in various fields such as research and industries**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Bonds in biological system: Principles of biophysical chemistry (ph2Henderson Hasselback equation) Buffers and its role in biological systems. Solution and its types. Osmosis, diffusion and its significance in biological systems	Tutorials, Collaborative, Demonstrations, Project methods Experiments	8
2	Carbohydrates: Monosaccharide: Classification, Common Disaccharides, Structure and occurrence of storage and structural polysaccharides	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments	9
3	Lipids: Classification, structure-function, role in biological membrane, Lipoprotein, structure and functions. Prostaglandins and its role in biological systems	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	9
4	Amino Acids: structure, nomenclature and general properties, Peptide bond, Classification of amino acids Proteins; Levels of organization Primary, Secondary structure, domains, motif and folds)., tertiary and Quaternary Conformation of proteins (Ramachandran plot, Stability of Proteins	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lectures	9
5	Composition, structure and function of nucleic acids. Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA). Vitamins: Classification: source and biochemical function, RDA. Nucleic acids: DNA, RNA-basic structure (nucleosides and nucleotides): double helical structure of DNA (Watson - Crick Model), types of DNA, B-, A- and Z-DNA.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lectures	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Quantitative analysis of sugar in the given plant sample	PBL	BL4-Analyze	4
2	Qualitative analysis of sugars.by Molisch's Test	Experiments	BL4-Analyze	2
3	Qualitative analysis of reducing sugars by Fehling's Test	Experiments	BL4-Analyze	2
4	Qualitative analysis of sugars.by Barfoed's Test	Experiments	BL4-Analyze	2
5	Qualitative analysis of ketose sugars by Seliwanoff Test.	PBL	BL4-Analyze	2
6	Qualitative analysis of amino acids by ninhydrin Test.	Experiments		2
7	Qualitative analysis of peptide bond by Biuret Test	Experiments	BL5-Evaluate	2
8	Qualitative analysis of protein by Xanthoproteic Test.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	U Satyanarayan,U Chakrapani Biochemistry 3rd Edition
Articles	https://www.mdpi.com/1422-0067/22/22/12219
References Books	G.Zubay Biochemistry 3rd Edition
MOOC Courses	https://nptel.ac.in/courses/104105076
Videos	https://nptel.ac.in/courses/104105076

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	3	2	2	2	2	-	-	-	2	-	-	1	-	3
CO3	3	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	3	1	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	General Microbiology
Course Code	BSBT102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	the basic concepts and view of professional and scientific communication approaches for microbiology settings			**Co-Requisite/s**	comprehensive understanding of sterilization processes and media preparation pipelines			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	History and scope of microbiology, modern development of microbiology, Classification of microorganism: Haeckel's; three kingdom concepts, Whittaker; five kingdom concepts. Introduction and general characteristic of bacteria, fungi. Algae and virus and their physiological characteristics	Tutorials, Collaborative, Demonstrations, Project methods Experiments	8
2	Concept of Sterilization - Definition of sterilization, methods of sterilization; dry and moist heat, pasteurization, tantalization; radiation, filtration, disinfection, sanitization. Stains and staining techniques -Mechanism of gram staining, acid fast staining, negative staining, capsule staining, flagella staining.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Culture media: Type of media and their uses, pure culture techniques. Microbial growth: growth curve, measurement of growth and factor affecting the growth, Microbial nutrition: Nutritional classification of microorganism. Cultivation of microorganism: aerobic and anaerobic culture and preservation of microbial culture. Oxygen toxicity: Study of catalase, peroxidase, superoxidase, dismutase, mechanism of oxygen toxicity	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	9
4	Gene transfer mechanisms: transformation, transduction, conjugation and transfection, Mechanism and applications, genetic analysis of microbes- bacteria and yeast. Plasmids: characteristics and their uses.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Genetic analysis of bacteria: Importance and uses of Mutation analysis. Inheritance in bacteria, types of mutations, spontaneous and induced mutagenesis.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Preparation of broth and liquid culture media to grow the test bacterial culture.	Experiments	BL2-Understand	2
X	To isolate bacteria flora from the different location of the university campus.	PBL	BL5-Evaluate	7 days
III	Perform the simple staining of the given test organisms to observe their shape.	Experiments	BL2-Understand	2
IV	Perform the negative staining of the given test organisms to observe their shape.	Experiments	BL2-Understand	2
V	Perform the Gram's staining of the given test organism	Experiments	BL2-Understand	2
VI	Perform the Endospore staining of the given test organisms.	Experiments	BL3-Apply	2
VII	Check the effect of UV radiation on the growth of microorganisms.	Experiments	BL3-Apply	2
VIII	Demonstrate the acid and gas production by the organisms.	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Nancy Trun and Janine Trempy-Fundamental Bacterial Genetics-1st Edition
Articles	https://bmcmicrobiol.biomedcentral.com/articles
References Books	U.N. Streips and R.E. Yasbin-Modern Microbial Genetics-2nd Edition
MOOC Courses	https://nptel.ac.in/courses/102105087 https:el.ac.in/courses/102103015//n
Videos	https://nptel.ac.in/courses/102105087 https.el.ac.in/courses/102103015//npt

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	1	3	-	-	-	-	-	-	1	2	3
CO2	2	3	3	2	1	3	1	-	-	-	-	-	2	3	3
CO3	3	3	1	1	3	3	-	-	-	-	-	-	3	3	3
CO4	1	3	1	3	1	3	-	-	-	-	-	-	1	3	3
CO5	2	1	3	3	3	2	2	-	-	-	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Cell Structure and Dynamics
Course Code	BSBT103[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have basic knowledge of cell, its structure and functions			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students should develop the concept of the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles**(BL1-Remember)** **CO2-** Students will understand how these cellular components are used to generate and utilize energy in cells**(BL2-Understand)** **CO3-** Students will recognize the cellular components underlying mitotic cell division**(BL3-Apply)** **CO4-** Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function**(BL4-Analyze)** **CO5-** Students will create a model by using cell biology basics**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction of Cell Structure: Prokaryotic and Eukaryotic cell Bio membrane: Composition and Models, fluid mosaic model and movement of lipids Diffusion potential and Nernst Equation Transport across cell membrane and Types and Function	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
II	Intracellular compartments and protein sorting, Compartmentalization Protein sorting and its types, Co translational translocation of protein and its types, Protein sorting into Golgi body and Lysosomes, Protein sorting into nucleus and mitochondria	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
III	Cytoskeleton Structure: Types of Filaments and its working mechanism, Microtubules, Intermediate filaments, Actin Filaments, Cell contraction and Locomotion (Sliding Filament Theory)	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
IV	Cell –Cell interaction: Extra cellular matrix: Composition and Function Cell-cell junction (anchoring. Occluding and Gap junctions). Proteins involved in junctional complex: structure and function	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9
V	Cell- Cell communication and Physiological function of the cell Mechanism of cell signalling and its types, Signalling molecule and receptors: types and functions, Comparison in Apoptosis and Necrosis with Examples	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Introduction to chromosome preparation: Pre-treatment, Fixation, Staining, Squash and Smear preparation. Preparation of permanent slides	Experiments	BL2-Understand	2
II	Determination of miotic index and frequency of different mitotic stages in pre-fixed root tips of Allium cepa	Experiments	BL4-Analyze	2
III	Study of mitotic chromosome: Metaphase chromosome preparation	Experiments	BL2-Understand	2
IV	The determine osmolarity in RBCs.	Experiments	BL4-Analyze	2
V	The fractionation of rat Liver	Experiments	BL5-Evaluate	2
VI	Estimation of chlorophyll content in spinach leaves.	Experiments	BL4-Analyze	2
VII	Isolation of chlorophyll types by TLC.	Experiments	BL4-Analyze	2
VIII	Differential Centrifugation of various organalles	PBL	BL4-Analyze	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	Molecular Biology of the Gene. Seventh Edition (2013). James D. Watson, Tania A. Baker, Stephen Molecular Cell Biology, Eighth Edition (2013). Harvey Lodish, Arnold Berk. W. H. Freeman Co.,
Articles	https://training.seer.cancer.gov/anatomy/cells_tissues_membranes/cells/structure.html
References Books	Molecular Biology of the Cell. Sixth Edition (2014). Bruce Alberts, Alexander Johnson, Julian Lewis
MOOC Courses	https://nptel.ac.in/courses/102103012
Videos	https://nptel.ac.in/courses/102103012

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	3	-	-	-	-	-	-	-	3	2
CO2	1	2	3	1	2	1	1	-	-	-	-	-	3	2	2
CO3	1	1	1	1	-	1	-	-	-	-	-	-	3	2	1
CO4	3	1	1	3	-	-	1	-	-	-	-	-	2	1	1
CO5	1	1	2	3	1	2	-	-	-	-	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Immunology
Course Code	BSBT202(T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	This course will introduce to the applied aspects of immunology in disease detection and diagnosis			**Co-Requisite/s**	The students should be well versed with different types of immune responses which show different types of changes.			
Course Outcomes & Bloom's Level	**CO1-** To remember the structure of various Immunological Barriers of the body**(BL1-Remember)** **CO2-** To understand the Different cells & proteins involved in Immune system**(BL2-Understand)** **CO3-** To understand the connection of immune system failure & disorders.**(BL2-Understand)** **CO4-** To apply the use of Proteins & receptors in antibody formation**(BL3-Apply)** **CO5-** To evaluate the applications of Antigens & Antibodies in Diagnostic & Medical Research**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to the immune system, Cells and organs of the immune system, Hematopoietic development and mediators of the process. Sign and symptoms and mechanism involved in inflammatory response.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Innate and Adaptive immune responses: Anatomical and Physiological barriers of the innate immunity. Receptors of Innate Immune system. Connection between innate and adaptive immune response and its mechanism.Antigens& Immunogens and its properties, Epitopes and CDRS	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Structure, classification and functions of Antibody, Antigen-antibody reactions :Precipitation and agglutination reactions, Organization and expression of Immunoglobulin genes, Monoclonal antibodies: production and application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Major histocompatibility complex (MHC), Types of MHC and Display of antigenic peptide, Role of MHC in antigen processing and presentation. Complement system: component, activation pathway , Complement deficiency diseases	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Hypersensitivity: Allergens and its types, types of hypersensitivity and There mechanism, Introduction to Autoimmune disorders(Central and peripheral Tolerance). Immunization: active and passive immunization, types of vaccines and their production strategy.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Anatomical view of mammalian thymus and various immune organs	Experiments	BL3-Apply	2
2	Study about Covaxin vaccine administration in local area and effect visualized	Internships	BL4-Analyze	15 DAYS
3		PBL		
4	To perform Radial immune diffusion	Experiments	BL3-Apply	2
5	To perform Double immuno diffusion	Experiments	BL3-Apply	2
6	Haemoglobin detection by given Blood Sample	Experiments	BL3-Apply	2
VII	Detection of Hb% of human population in locality and relate to their nutrition diet.	PBL	BL4-Analyze	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Immunology by Kindt, Goldsby, Osborne, 4th Edition
Articles	https://njms.rutgers.edu/sgs/olc/mci/prot/2009/Hypersensitivities09.pdf
References Books	Essentials Immunology, Ivam M Roitt, 12th Edition
MOOC Courses	https://nptel.ac.in/courses/104108055
Videos	https://nptel.ac.in/courses/104108055

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	2	2	-	1	-	-	-	-	-	1	2	2
CO2	1	2	2	3	1	3	1	-	-	-	-	-	1	2	2
CO3	1	2	1	2	1	2	2	-	-	-	-	-	1	2	2
CO4	1	2	1	2	1	2	2	-	-	-	-	-	3	3	3
CO5	1	2	2	1	2	-	2	-	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Genetics
Course Code	BSBT303(T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Generic Elective							
Pre-Requisite/s	Knowladge about Fundamentals and principles about genetics also provide knowladge about Genetic techniques.			**Co-Requisite/s**	Relate all Biotech and microbiology engeneering techniques like RDT PTC ATC etc.			
Course Outcomes & Bloom's Level	**CO1-** To describe basic principles and concepts of genetics**(BL1-Remember)** **CO2-** To understand the Mendalian and non Mendalian inheritance**(BL2-Understand)** **CO3-** To understand the importance of heredity and its applications**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to acquire a specialized knowledge and understanding in advanced the field of genetics**(BL4-Analyze)** **CO5-** To evaluate the applications of genetics in various fields such as research **(BL5-Evaluate)** **CO6-** To apply the understanding of heredity and variation and genetic disorders and mutations and others in various fields or industries**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG4(Quality education) SDG11(Sustainable cities and economies) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	Chromosomes: Transmitters of heredity structure, types and special type of chromosomes Mendalism: Law of Inheritance Concept of gene : Allele, Multiple alleles: ABO System and Rh factor Importance of Blood Groups in Blood transfusion Extensions of Mendalism: Co-dominance, incomplete dominance gene interaction: Epistasis	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Sex determination and sex linkage: Sex chromosomes mechanism of sex determination Sex linked inheritance (Color blindness and Hemophilia) Linkage and crossing over gene expression Chromosome mapping: Gene mapping methods Linkage maps Twins: physical and mental traits	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Gamete formation: Spermatogenesis and Oogenesis Mitosis & Meiosis: Stages and significance differences. Nucleic Acids, DNA Replication Introduction to Genetic Engineering in brief Fine structure of gene genetic Code Split gene overlapping and pseudo gene.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Extra chromosomal inheritance in Mitochondrial and Chloroplast effect Maternal inheritance Nucleo-cytoplasmic interaction Genetic disorders: Human Syndromes	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Mutation : Types causes and detection Types of mutants – lethal, conditional, biochemical, loss of function gain of function, germinal verses somatic mutants Gene mutation: Causes, insertion mutagenesis Chromosomal aberrations: variation in chromosome number Change in chromosome structure	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Identification of chromosomes and spotting as per theory syllabus	Experiments	BL2-Understand	4
2	Study of Linkage and sex linked inheritance	Experiments	BL3-Apply	4
3	Study of Mitosis and meiosis	Experiments	BL3-Apply	4
4	Study of Nucleic acids	Experiments	BL2-Understand	4
5	study of syndroms and other mutation	Field work	BL4-Analyze	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Principles of genetics By P K Gupta
Articles	https://www.nature.com/scitable/topicpage/gregor-mendel-and-the-principles-of-inheritance-593/
References Books	Genetics BY B D singh Genetics By: A G Gardner
MOOC Courses	https://nptel.ac.in/courses/102104052
Videos	https://www.google.com/search?sca_esv=e2da69de12d3bb4c&sca_upv=1&rlz=1C1NMEO_enIN999IN999&q=Principles+of+Genetics&tbm=vid&source=lnms&prmd=ivsnbmtz&sa=X&ved=2ahUKEwiHpqq9ioqGAxVG4zgGHcRzAgkQ0pQJegQIDBAB&biw=1366&bih=625&dpr=1#fpstate=ive&vld=cid:d538888b,vid:-PtxId_Ga7k,st:0

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	2	-	-	-	-	-	-	-	-	1	2	3
CO2	2	3	1	2	-	-	-	-	-	-	-	-	2	2	3
CO3	2	2	2	1	-	-	-	-	-	-	-	-	2	1	3
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	1	2
CO5	1	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CO6	-	1	-	2	-	-	-	-	-	-	-	-	-	1	1

Syllabus-2023-2024

BSc_PCM

Title of the Course	Fundamental of Chemistry -I
Course Code	BSCH0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of periodic table and atomic structure			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic knowledge of Atomic Structure, Chemical bonding**(BL1-Remember)** **CO2-** To understand Properties of Inorganic Compounds**(BL2-Understand)** **CO3-** To Apply the compounds in the application**(BL3-Apply)** **CO4-** To Analyse the Structure and Properties of Inorganic Compounds**(BL4-Analyze)** **CO5-** To Evaluate the results analyzed**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Dual Nature of matter idea of de Broglic matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Y and Y', quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p and d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule, Electronic configuration of the elements, effective nuclear charge. B. Periodic Properties Atomic and ionic radii, ionization energy, electron affinity and electro negativity-definition, methods of determination or evaluation, Trends in periodic table and applications in predicting and explaining the chemical behavior	Stoy telling activity Experienced examples, Quizzes Summarizing, PPT's Leaving Questions	8
Module 2	UNIT – II: Chemical Bonding – part I (A) Covalent Bond-valence bond theory and its limitations. Directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH3,H3O SF4, CIF3 and H2O MO theory, homo nuclear and hetero nuclear (CO and NO)4 diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy.		8
Module 3	UNIT – III: Chemical Bonding – part II (A) Ionic Solids-Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Metallic bond-free electron, balance bond and band theories. (B) Weak Interactions-Hydrogen bonding, van der waals forces 1. Chemistry of nobles gases	Demonstrations, Videos, PPT's Quizes, Group discussions	8
Module 4	S-Block Elements Comparative study Li and Mg. diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio systems an introduction to alkyls and aryls. p-Block Elements part – I Comparative study Be and Al (including diagonal relationship) of groups 13-17 elements. Compounds like hydrides. Oxides, oxyacids and halides of groups 13-16	Interactive videos PPT's Experienced examples, Quizzes', Seminar	8
Module 5	p-Block Elements Part – II Hydrides of boron-diborane and higher boranes, borazine, boroydrides, Fullerenes, fluorocarbons, silicates (structural principle), tetra-sulphur tetra-nitride, basic properties of halogens, interhalogens and Polyhalides.	Interactive videos , PPT's Experienced examples, Quizzes',	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module 4	Anionic Radical Testing	Experiments	BL3-Apply	8
Module 4	Cationic Radical Testting	Experiments	BL3-Apply	8
Module 4	To study the structure of Ionic solids	PBL	BL3-Apply	6
Experiment	To Identify the Acid Radical(Acetate)	Experiments	BL3-Apply	2
Experiment	To Identify the Acid Radical (Sul hide)	Experiments	BL3-Apply	2
Experiment	To Identify the Acid Radical(Carbonate)	Experiments	BL3-Apply	2
Experiment	To Identify the Acid Radical (Oxalate)	Experiments	BL3-Apply	2
Experiment	To Identify the Ammonium Basic Radical	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	M.N.N Tandon Unified Chemistry 2010 O.P Tandon Chemistry Third Edition
Articles	
References Books	J.D.Lee Concise Inorganic Chemistry Fifth Edition J.E. Huheey Inorganic Chemistry Fourth Edition Cotton Wilkinson Advanced Inorganic Chemistry Third Edition
MOOC Courses	https://nptel.ac.in/courses/104103069
Videos	https://nptel.ac.in/courses/104103069

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	3	1	-	-	-	-	-	-	-	-	-	2	2	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Analytical Chemistry
Course Code	BSCH0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of Fundamentals of Analytical Chemistry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic concept and principle of analytical techniques**(BL1-Remember)** **CO2-** To understand the difference between the analytical techniques**(BL2-Understand)** **CO3-** To use/apply the basic statistical treatment of the analytical data for getting a correct result and analytical methods**(BL3-Apply)** **CO4-** To Analyse Qualitative and Quantitative aspects**(BL4-Analyze)** **CO5-** To Evaluate the data obtained from the analysis**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	General purification techniques Purification of solid organic compounds, recrystallisation, use of miscible solvents, use of drying agents and their properties, sublimation. Purification of liquids. Different types of extraction: use of immiscible solvents solvent extraction, efficiency of extraction, selectivity of extraction, liquid phase and solid phase extraction systems, methods of extraction, applications. Chemical methods of purification and test of purity	Problem solving sessions, Experienced examples, Quizzes Summarizing, Leaving Questions Hand on Experience ,Tutorials	8
Module 2	Titrimetric Methods of Analysis General Introduction General principle. Types of titrations. Requirements for titrimetric Analysis. Concentration systems: Molarity, formality, normality, wt % ppm, milliequivalents and millimoles-problems Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitation of volumetric analysis, end point, equivalence point	Learn by doing, Simulations/ Virtual labs, Videos	8
Module 3	Chromatography, Introduction, Principle of chromatography, Classifications of chromatography, Techniques of paper and column chromatography, Thin Layer Chromatography(TLC) Partition chromatography, Ion exchange chromatography	Tutorials, Virtual labs, Demonstrations, Experiments	8
Module 4	Thermal Analysis Thermal analytical methods, principle involved in thermogravimetric analysis differential gravimetric analysis and differential scanning calorimeter, discussion of various components with block diagram, characteristics of TG and DTA, Factors affecting TG, DTA and DSC Curves	Problem solving sessions, Expeienced examples,	8
Module 5	Evaluation and procession of analytical data, Precision and accuracy, Types of errors, Normal distribution curve, Standard deviation, Confidence limit, Graphical presentation of result-method of average, Method of linear list square, Significant figures, Statistical aid to hypothesis testing: t–test & F-test, Correlation coefficient, Rejection of data	. Problem solving sessions, Expeienced examples,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Complexometric titration	Experiments	BL3-Apply	4
VIII	Qualitative Analysis using Thin Layer Chromatography	PBL	BL4-Analyze	6
IX	Purification of sample by Crystallization technique	PBL	BL6-Create	7
IV	To determine the Percentage of Copper in copper alloy solution	Experiments	BL3-Apply	2
V	To determine the percentage of Chromium in chrome alloy	Experiments	BL3-Apply	2
VI	To purify the given sample Ammonium Chloride	Experiments	BL3-Apply	
VII	Qualitative Analysis using Paper, Chromatography	PBL	BL4-Analyze	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Y Anjaneyulu Textbook of Analytical Chemistry 2008
Articles	https://nptel.ac.in/courses/104105084
References Books	Skoog D.A. and West D.M. Saunders Fundamental of Analytical Chemistry Ninth Edition
MOOC Courses	https://nptel.ac.in/courses/104105084
Videos	https://nptel.ac.in/courses/104105084

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	1	-	2	-	-	-	-	-	-	-	-	1	1	2
CO4	2	3	-	-	-	-	-	-	-	-	-	-	1	1	2
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Inorganic Chemistry
Course Code	BSCH0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	knowledge of Coordination bonding in complexes Transition elements and their properties			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember Knowledge of Transition elements, Acids and Bases, Oxidation and reduction, Complexes , Lanthanides, Actinides**(BL1-Remember)** **CO2-** To understand Properties and uses of Transition elements, Coordination compounds, Acids and Bases , Non aqueous solvents Lanthanides, Actinides**(BL2-Understand)** **CO3-** To Apply the Transition elements, Complexes, Lanthanides, Actinides in the different application**(BL3-Apply)** **CO4-** To inspect the Structure , Bonding ,Magnetic Properties of Transition elements, Complexes**(BL4-Analyze)** **CO5-** To Assess the results analyzed**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Chemistry of Elements of First Transition Series: Characteristic properties of d-block elements Properties of the elements of the first transition series, their binary compounds such as Carbides, Oxides and Sulphides Complexes illustrating relative stability of their oxidation states, co-ordination number and geometry	Stoy telling activity Mnemonics Experienced examples, Quizzes Summarizing, PPT's Leaving Questions	8
Module 2	UNIT – II: Chemistry of Elements of second and Third Transition Series: General characteristics, Periodic Properties Atomic Radii Ionic Radii Ionization Energy comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry	Mnemonics , Experienced examples, , Videos , PPT's Quizes	8
Module 3	UNIT – III: A. Co-ordination Compounds Werner's co-ordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of co-ordination compounds, isomerism in co-ordination compounds, valance bond theory of transition metal complexes theory of transition metal complexes B. Oxidation and Reduction Use of redox potential data: analysis of redox cycle, redox stability in water: Frost, latimer and Pourbaix diagrams, Principles involved in the extraction of element	Demonstrations, Videos, PPT's Quizes, Virtual labs Group discussions	8
Module 4	UNIT – IV A. Chemistry of Lanthanide Elements Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. B. Chemistry of Actinides General features and chemistry of actinides, chemistry of separation of Np. Pu and Am from U, similarities between the later actinides and the later lanthanides	Interactive videos PPT's Experienced examples, Quizzes', Mnemonics	8
Module 5	UNIT – V A. Acids and Bases Arrhenius, Bronsted- Lowry, the Lux-Flood, solvent system and lewis concepts of acids and bases B. Non-aqueous Solvents Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH3 and liquid SO2	Interactive videos , PPT's Experienced examples, Quizzes', Seminar	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module 3	Synthesis of Complex and Double salt	PBL	BL3-Apply	6
Module 5	Non Aqueous Titration	PBL		8
Experiment	Identify the Acid Radical in given inorganic mixture	Experiments	BL3-Apply	2
Experiment	Identify the Acid Radical (Sulphate)in the given inorganic sample	Experiments	BL3-Apply	2
Experiment	Identify the Acid Radical (Sulphite)in a given inorganic sample	Experiments	BL3-Apply	2
Experiment	Identify the Acid Radical (Nitrite)in the given inorganic sample	Experiments	BL3-Apply	2
Experiment	Identify the Basic Radical (Zero group) in the given sample	Experiments	BL3-Apply	2
Experiment	Identify the Basic Radical (First Group) in the given sample	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	M.N.N Tandon Unified Chemistry 2010
Articles	
References Books	J.D.Lee Concise Inorganic Chemistry Fifth Edition
MOOC Courses	https://nptel.ac.in/courses/104101121
Videos	https://nptel.ac.in/courses/104101121

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	2	2	1
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	2	2
CO3	3	3	1	-	-	-	-	-	-	-	-	-	2	2	1
CO4	2	3	1	-	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	-	1	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Organic Chemistry
Course Code	BSCH0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	The students should have basic knowledge of organic chemistry			**Co-Requisite/s**	The student must have studied organic chemistry in B.Sc. Certificate course			
Course Outcomes & Bloom's Level	**CO1-** To remember concept of substitution reactions**(BL1-Remember)** **CO2-** To understand the concept of addition and elimination reactions **(BL2-Understand)** **CO3-** To apply the various reagents in the organic synthesis**(BL3-Apply)** **CO4-** To recognize mechanism of oxidation reaction.**(BL4-Analyze)** **CO5-** To know the chemistry of photochemical reactions. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	**Contents**	**Pedagogy**	**Hours**
Unit 1	Substitution Reactions: Aliphatic Nucleophilic Substitution : Introduction, the SN1, SN2 and SNi mechanisms, neighbouring group participation, effect of substrate, nucleophile, leaving group and reaction medium. Aliphatic Electrophilic Substitution : Elementary treatment	Lecture methods, short vedios, ABCA	8 hrs
Unit 2	Addition and Elimination Reactions Addition Renctions: Introduction, reactions involving addition of nucleophile, electrophile and frec radicals, regio-selectivity and chemo-selectivity, orientation and reactivity, Markovnikov and Anti-Markovnikov's addition. Elimination Reactions : Introduction, E1, E2 and ElcB mechanisms, effect of substrate, attacking species, leaving group and reaction medium, orientation Saytzeff and Hofmann rule	Audio/Video clips, group discussion, lecture with methods	8 hrs
Unit 3	Reagents and Catalysts (Mechanisms and Applications) Reagents and Catalysts : Preparation, properties and applications of important reagents and catalysts in organic synthesis with mechanistic details : Grignard reagent, N-bromo succinimide (NBS), diazomethane, anhydrous aluminium chloride (AlCl3), sodamide (NaNH2), Ziegler-Natta catalyst	Summarizing, PBL (small working models), Quiz, Virtual Lab, Tutorials sessions, Expert Lecture, lecture methods	8 hrs
Unit 4	Oxidation Reactions : Introduction, metal based and non-metal based oxidations, oxidation of alcohols to carbonyls (chromium, manganese, and silver based reagents), alkenes to epoxides (peroxides/ peracids based, alkenes to diols (manganese and osmium based), alkenes to carbonyls with bond cleavage (manganese and lead based), Oppenauer oxidation	Lecture methods, short vedios, ABCA	8 hrs
Unit 5	Photochemical Reactions : Introduction to photochemistry, electronic excitations, Jablonski diagram, Norrish type I and II reactions and cis-trans isomerization	Summarizing, PBL (small working models), Virtual Lab, Tutorials sessions, Expert Lecture	8 Hrs

Part C

Modules	**Title**	**Indicative-ABCA/PBL/ Experiments/Field work/ Internships**	**Bloom's Level**	**Hours**
1	Qualitative analysis: Separtion of binary organic micture, Systematic identificationof separated organic compounds.	Experiments	BL4-Analyze	8 hrs
2	Oxidation of benzaldehyde to benzoic acid by KMnO4	Experiments	BL5-Evaluate	2hrs
3	Oxidation of cyclohexanone to adipic acid by HNO3	Experiments	BL5-Evaluate	2hrs
4	(4+2) Cycloaddition reaction of antracene and maleic anhydride	Experiments	BL4-Analyze	4hrs
5	Preparation and purification of product and determination of melting point of Acetanilide to p-nitro acietanilide to para nitroaniline	Experiments	BL6-Create	4 hrs
6	Preparation and purification of product and determination of melting point o azo dyesf	PBL	BL6-Create	8hrs
7	Application of Substitution reactions	Seminar	BL2-Understand	1hr
8	To see the use of reagents in organic synthesis	Industrial Visit	BL2-Understand	5hrs
9	To study the conversion of alkenes to diols (manganese and osimium based	Research Paper Presentation	BL3-Apply	5hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	

Part E

Books	Unified Chemistry by MMN tondon
Articles	
References Books	Clayden, J., Greeves, N. and Warren S. Organic Chemistry, Oxford University Press, India, 1012, Second Edition Jerry March Advanced Organic Chemistry" John Wiley and Sons (Asia) Hornback, 1. M. "Organic Chemistry" Thomson Learning, Singapore, 2006, Second Edition. Ahluwalia, V. K. and Parashar R. K., "Organic Reaction Mechanisms", Narosa Publication, India, 2010, Fourth Edition. Goswami, C., "Snatkottar Prakash Rasayan evm Thos Avastha Rasayan", Hindi Granth Academy, Bhopal, Madhya Pradesh, 2019 .
MOOC Courses	https://nptel.ac.in/courses/104/101/10401115/ https://nptel.ac.in/courses/104/103/10403111/ https://nptel.ac.in/courses/104/106/10406077/
Videos	http://www.mphindigranthacademy.org/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	3	2	3	3	3
CO2	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2
CO3	3	2	2	1	-	-	-	-	-	-	1	2	2	2	1
CO4	3	3	1	1	-	-	-	-	-	-	1	2	1	1	1
CO5	3	2	1	1	-	-	-	-	-	-	1	1	1	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Physical Chemistry
Course Code	BSCH0501[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of Quantum Mechanics Plank Theory of Radiation			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember Knowledge of Quantum Mechanics, Spectroscopy, Photochemistry**(BL1-Remember)** **CO2-** To understand Mechanism of Quantum Mechanics, Spectroscopy, Photochemistry**(BL2-Understand)** **CO3-** To Apply the concept in the different application**(BL3-Apply)** **CO4-** To Analyze the Physical Pope ties of compounds**(BL4-Analyze)** **CO5-** To Evaluate the results analyzed**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**		SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Elementary Quantum Mechanics: Black-body radiation. Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton Effect. De-Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, Particle in a one- dimensional	Story telling Experienced examples, Quizzes Summarizing, PPT's Leaving Questions Interactive videos	8
Module 2	Spectroscopy introduction: electromagnetic radiation. Regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, Degrees of freedom Rotational Spectrum: Diatomic molecules, Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect. Vibrational Spectrum: Infra-red spectrum: Energy levels of simple harmonic oscillator, selection rules, pure Vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of an harmonic motion and isotope on the spectrum, Idea of Vibrational frequencies of different functional groups	Demonstrations, Tutorials Experienced examples, , Videos , PPT's Quizzes', Group discussions	8
Module 3	Ra man Spectrum: Concept of polarisability, pure rotational and pure Vibrational Raman spectra of diatomic molecules, Selection rules. Electronic Spectrum: Concept of potential energy curves for bonding and anti bonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of σ,π and n M. O. their energy levels and the respective transition UV Spectroscopy: Electronic excitation, elementary idea of instrument used. Application to organic molecules, Woodward- Fieser rule for determining λmax of enes, polyenes and α,β unsaturated carbonyl compounds	Demonstrations, Videos, PPT's Quizzes', Virtual labs	8
Module 4	Unit -IV: Photochemistry Interaction of radiation with matter, difference between thermal and photochemical processes, Laws of photochemistry: Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions energy transfer processes (simple examples.)	Interactive videos PPT's Experienced examples, Quizzes' Seminar	8
Module 5	V: Physical Properties and Molecular Structure Optical activity, Polarisation (Clausius – Mossotti equation), Oriented of dipoles in an electric field, dipole moment, induced dipole moment measurement of dipole moment, temperature method and refractive method, dipole moment and structure of molecules, magnetic properties – paramagnetism, diamagnetism and ferromagnetism	Interactive videos , PPT's Experienced examples, Quizzes', Seminar	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module 2	Determination of Concentration of the solution using colorimetry	Experiments	BL3-Apply	6
Module 3	Determination of wavelength maxima using UV-Visible spectroscopy	PBL	BL3-Apply	6
Module 2	Determination of functional groups using IR Spectroscopy	PBL	BL3-Apply	6
Experiment	Deterime the strength of NaOH using N/10 HCl BY PH Metric titration	Experiments	BL3-Apply	2
Experiment	Determine the strength of NaOH using N/10 Acetic Acid	Experiments	BL3-Apply	2
Experiment	Determine the strength of Base using Acid BY Conductometric titration	Experiments	BL3-Apply	2
Experiment	Determine the strength of Strong Base with weak acid by Conductometric titration	Experiments	BL3-Apply	2
Experiment	Verify Lambert - Beer Law by Colorimetric method	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	M.N.N Tandon Unified Chemistry 2010
Articles	
References Books	Puri Sharma Pathania Physical Chemistry Fourth Edition
MOOC Courses	https://nptel.ac.in/courses/104101126
Videos	https://nptel.ac.in/courses/104101126

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	2	1	1
CO3	3	3	1	-	-	-	-	-	-	-	-	-	2	2	1
CO4	3	3	1	-	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	-	1	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Programming in C
Course Code	BSCS0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic knowledge of computer fundamental, algorithm and flowchart			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To Remember the basics of Computer Knowledge.**(BL1-Remember)** **CO2-** To Understand debugging and testing, implementation and maintenance.**(BL2-Understand)** **CO3-** To apply the various techniques for C Programming.**(BL3-Apply)** **CO4-** To analysis modular programming**(BL4-Analyze)** **CO5-** To Evaluate Students will learn to write algorithm for solutions to various real-life problems.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Classification of programming language: procedural languages, problem oriented languages, non-procedural languages, Structured programming concepts: modular programming: top-down analysis, bottom-up analysis, structured programming. Problem solving using computers: problem definition and analysis, problem design, coding, compilation, debugging and testing, documentation, implementation and maintenance.	White Board, Group Discussion	8
2	Introduction to C language: constants, variables, keywords, data types, operators, expressions, operator precedence and associativity. Structure of C program: variable declaration of variable as constant.	White Board, Group Discussion	8
3	Managing input/output operators: formatted and unformatted. Control statements: branching, jumping & looping, scope rules, and storage classes.	White Board, Group Discussion	8
4	Arrays (one and two dimensional), Functions: user defined function, standard function, categories in functions, passing arguments to a function, recursion. Pointers: operators, declaration, pointer to arithmetic, array of pointers. Structures: declaring, accessing, initializing, array of structures.	White Board, Group Discussion	8
5	File handling in C: opening and closing a data file, inserting data to data file. Graphics programming- introduction, functions, stylish lines, drawing and filling images, palettes and colours, justifying text, bit of animation.	White Board, Group Discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Write a program to print digits of entered number in reverse order.	Experiments	BL2-Understand	2
2	Write a program to print sum of two matrices.	Experiments	BL2-Understand	2
3	Write a program to print subtraction of two matrices.	Experiments	BL2-Understand	2
4	Write a program to print multiplication of two matrices	Experiments	BL2-Understand	2
5	Write a program to demonstrate concept of structure.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Let us C by Yashwant Kanetkar ANSI C by Balagurusamy
Articles	
References Books	Introduction to Algorithms by Cormen, PHI Programming in C: Denis Richie
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Basics of Computer and information technology
Course Code	BSCS0102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Preliminary knowledge of computer, their operations and applications.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	MS Word Text Editing and formatting using Word 2007 & onwards versions and Formatting documents	Experiments	BL2-Understand	2
2	MS Power point Creating presentation using slide master and template in various themes & variants.	Experiments	BL2-Understand	2
3	MS Excel Working with slides: New slide, move, copy, delete, duplicate, slide layouts, presentation views.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	PC Software for Windows by R. K. Taxali Fundamental of Computers by P. K. Sinha
Articles	
References Books	Internet Security by Kenneth EinarHimma, 207 Computer Today by Suresh K. Basandra
MOOC Courses	
Videos	https://www.youtube.com/watch?v=q3rplCwtvU0

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-
CO4	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-
CO5	5	-	-	-	5	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Operating System
Course Code	BSCS0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	Must have knowledge the computer architecture.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Operating System Concepts An Introduction to Operating System
Articles	
References Books	Gavlin P. ,L. Abraham Silberschatz. Deitel, H.M.
MOOC Courses	
Videos	https://www.youtube.com/watch?v=vBURTt97EkA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	3	-	-	-	-	-	-
CO4	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-
CO5	-	-	-	5	-	5	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	DBMS
Course Code	BSCS0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic understanding of software and programming language. Basic data manipulation operations, file handling, file organization. Set Theory (Mathematics) Cartesian, cross product and discrete mathematics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	WAQ to insert some new records in emp table.	Experiments	BL2-Understand	2
2	WAQ to list the number of employees whose name is not „ford", „jams" or „jones"	Experiments	BL2-Understand	2
3	WAQ to list the name and salary and sort them in descending order of their salary	Experiments	BL2-Understand	2
4	WAQ to list the details of employees whose name is starts from „a"	Experiments	BL2-Understand	2
5	WAQ to delete all records form emp table	Experiments	BL2-Understand	2
6	WAQ to list the student name having „d" as second character.	Experiments	BL2-Understand	2
7	WAQ to list the name and salary and sort them Id descending order of their salary	Experiments	BL2-Understand	2
8	WAQ in employee table find all the manager who earns between 1000 and 2000	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Database System Concepts by Henry Korth and A. Silberschatz Simplification approach to DBMS, Prateek Bhatia, Gurvinder Singh Kalyani Publication
Articles	
References Books	An Introduction to Database System by Bipin Desai An Introduction to Database System by C.J. Date.
MOOC Courses	
Videos	https://www.youtube.com/playlist?list=PLxCzCOWd7aiFAN6I8CuViBuCdJgiOkT2Y

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	4	-	-	-	-	-	-	-	-	-	4	-	-	-
CO5	-	-	5	-	5	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Computer Networks
Course Code	BSCS0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Study of computer networks provides basic knowledge of Computer system architecture and various techniques used in it, along with error detection techniques like parity bit etc			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Configure to DNS Server	Experiments	BL2-Understand	2
2	Configure to DHCP Server	Experiments	BL2-Understand	2
3	Configure IP routing with RIP using CISCO Packet Tracer	Experiments	BL2-Understand	2
4	Configure to router for one network	Experiments	BL2-Understand	2
5	Configure to two different router	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Behrouz A. ; Data Communications and Networking. ForouzanMcGraw-Hill. Andrew S. Tanenbaum; Computer Networks; Pearson Prentice Hall
Articles	
References Books	William J. Beyda Data Communication Prentice Hall William Stallings Data and Computer Communications Pearson Prentice Hall
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Data Structure
Course Code	BSCS0302[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Basic understanding of computer fundamentals and programming in 'C'.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Write a program to find the factorial of a given no using recursion.	Experiments	BL2-Understand	2
2	Write a program for bubble sorting.	Experiments	BL2-Understand	2
3	Write a program for linear search.	Experiments	BL2-Understand	2
4	Write a program for binary search.	Experiments	BL2-Understand	2
5	Write a program for selection sorting	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	30

Part E

Books	Data Structure: By Lipschultz (Schaums Outline Series) Data Structure through C (A Practical Approach) by G.S. Baluja
Articles	
References Books	Fundamental of Data Structure by S. Sawhney & E. Horowitz
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Object Oriented Programming Concept using C++
Course Code	BSCS0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Students should have basic as well as practical knowledge of Programming and should be familiar with the concept of C.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1		Experiments	BL2-Understand	
2		Experiments	BL2-Understand	
3		Experiments	BL2-Understand	
4		Experiments	BL2-Understand	
5		Experiments	BL2-Understand	
6		Experiments	BL2-Understand	
7		Experiments	BL2-Understand	
8		Experiments	BL2-Understand	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	20

Part E

Books	Object Oriented Programming C++ C++
Articles	
References Books	R. Lafore E. Balguruswamy
MOOC Courses	
Videos	https://www.youtube.com/watch?v=wN0x9eZLix4

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	4	-	4	-	-	-	-	-	-	-	4	-	-	-
CO5	-	-	-	-	5	-	-	-	-	-	-	-	5	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Computer system organization
Course Code	BSCS0402[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	An Attendee of this course must be familiar with the following ❖ Digital Logic Gates ❖ Basic Computer Architecture ❖ Computer Number Systems			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)** **CO6- ()**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

ITM UNIVERSITY
GWALIOR • MP • INDIA
"CELEBRATING DREAMS"

Project Base Learning
Computer System Organization
BCA 301

S.no	Activity Details	Outcomes of the Activity
1	Overview of Register Transfer Language & micro-operations, Classification of Micro operations,	This activity help to study for better understanding of computer hardware operation.
2	Design of arithmetic, Logic and shift micro-operations.	This activity help to understanding of Logic and Shift micro-operations.
3	Architecture of a Processor, Concept of ALU, Control Unit, Registers Instruction Register, Control Word, Program Counter, Stack Organization, instruction set, instruction formats, addressing modes, instruction cycle, Interrupt and Interrupt cycle	This activity help to understanding various function of Computer Hardware.
4	Data Transfer Mode, Program Controlled, Interrupt driven, DMA (Direct Memory Access).	This activity will help to understanding the various Activity perform by Data Transfer and DMA.
5	Memory organization, Concept of Associative memory, cache memory organization, virtual memory organization	This activity will help to understanding the Memory Management in Computer Hardware etc.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Hayes, J. P. (2017). Computer System Architecture. McGraw Hill. Stallings, W. (2022). Computer Organization and Architecture. Prentice Hall.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	1	2	-	-	2	-	-	-	-	-	-	-	2	3	3
CO3	3	1	-	-	2	-	-	-	-	-	-	-	3	3	3
CO4	-	1	1	2	1	-	-	-	-	-	-	-	2	2	3
CO5	-	1	-	-	1	-	-	-	-	-	-	-	2	2	2
CO6	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Web Designing with PHP
Course Code	BSCS0501[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

PBL TOPICS

PHP

1. **Simple CMS (Content Management System):**
- Build a basic CMS using PHP where users can create, edit, delete, and manage content (e.g., articles, blog posts).
- Include features like user authentication, role-based access control, and a WYSIWYG editor for content creation.

2. **Online Quiz System:**
- Develop an online quiz application where users can take quizzes on various topics.
- Implement features such as user registration, quiz creation, multiple-choice questions, scoring, and result display.

3. **Online Task Management System:**
- Create a task management application where users can create tasks, assign them to others, set deadlines, and track progress.
- Include features like user authentication, task categorization, priority levels, and status updates.

4. **E-commerce Website:**
- Build a simple e-commerce platform using PHP where users can browse products, add them to cart, and make purchases.
- Implement features like user registration, product catalog, shopping cart functionality, and payment integration (e.g., PayPal).

5. **OnlineStudent Information System:**
- Develop a student information system for managing student records, course details, grades, and attendance.
- Include features such as user authentication, student enrolment, course registration, and grade management.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	VIKRAM VASWANI PHP A Beginner's Guide Tata McGraw-Hill
Articles	Steven Holzner The PHP Complete Reference – Tata McGraw-Hil
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	2	-	-	-	-	-	-	-	1	2	1
CO2	2	2	-3	2	1	-	-	-	-	-	-	-	2	2	2
CO3	2	1	1	1	3	-	-	-	-	-	-	-	1	2	1
CO4	1	2	-1	2	2	-	-	-	-	-	-	-	2	2	1
CO5	2	2	2	1	2	-	-	-	-	-	-	-	1	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Software Enineering
Course Code	BSCS0601[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	student must have knowledge about basic data structures , computer organization & programming language concepts.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)** **CO6- ()**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Case Study
Software Engineering (402)

1. Analysing the challenges and solutions for software maintenance: Students are required to identify the challenges appeared during software maintenance using various types of information gathering tools and must propose a systematic and feasible maintenance plan with output showing growth with respect to following points
    - User Satisfaction level
    - Software periodic update
    - Software Licence renewable
    - Software upgradability.

2. Perform automated testing and design customized test cases on any project modules. Also report the bugs encountered during testing phase and compute time incurred in rectifying bugs during testing phase. Compare the time involved in rectifying bugs at development phase and at testing phase.
3. You are required to build a Inventory management system for a departmental store, Prepare a logical design as well as use case and system flowcharts for the same.

4. You are required to build a Student information system for a departmental of school of Engineering, Prepare a logical design as well as use case and system flowcharts for the same.
5.
6. Compute the following using any project/modules of your choice
    - Product Metrics
    - Process Metrics
    - Project Metrics
7. Prepare a complete SRS report of a software that is not in existence as well as software that is already is being used but needs to be updated.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Pressman, R. S., & Dr, B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. http://books.google.ie/books?
Articles	
References Books	Pressman, R. S., & Dr, B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. http://books.google.ie/books?
MOOC Courses	
Videos	https://onlinecourses.nptel.ac.in/noc20_cs68/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	2
CO2	1	-	-	-	1	2	-	-	-	-	-	-	1	2	3
CO3	2	1	-	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO6	1	1	2	3	2	2	-	-	-	2	-	-	3	3	3

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Python programming
Course Code	BSCS0602[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
unit 1-5	PBL	PBL		4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Gondaliya, V. (2019, August 30). Programming With Python. Vaibhav Gondaliya.
Articles	
References Books	Hetland, M. L. (2006, November 7). Beginning Python. Apress
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	2	2	-	-	-	-	1	-	1	-	1
CO2	1	1	-	2	2	2	-	-	-	2	-	-	1	2	3
CO3	-	2	-	-	-	-	-	-	-	-	-	-	3	2	3
CO4	-	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO5	-	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Environmental Studies
Course Code	BSFC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Theory only							
Course Category	Interdisciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	B. S. Chauhan Environmental Science 2008 First Richards T. Wright & Dorothy F. Boorse Environmental Science: Toward a Sustainable Future 2016 S. K. Dhameja Environmental Engg. & Management 2000
Articles	
References Books	Gilbert M. Masters Introduction to Environmental Engineering and Science 1991 Stanley Manahan & Stanley E. Manahan Environmental Chemistry 2009
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	1	-	-	-	-	-	1	2	3
CO2	1	-	-	-	-	-	1	-	-	-	-	-	1	-	1
CO3	1	2	-	-	-	-	1	-	-	-	-	-	1	2	-
CO4	1	2	-	2	-	-	-	2	-	-	-	-	1	2	3
CO5	1	2	-	-	-	-	-	2	-	-	-	-	1	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Environmental Studies
Course Code	BSFC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Theory only							
Course Category	Interdisciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	B. S. Chauhan Environmental Science 2008 First Richards T. Wright & Dorothy F. Boorse Environmental Science: Toward a Sustainable Future 2016 S. K. Dhameja Environmental Engg. & Management 2000
Articles	
References Books	Gilbert M. Masters Introduction to Environmental Engineering and Science 1991 Stanley Manahan & Stanley E. Manahan Environmental Chemistry 2009
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Introduction To Food Technology [T]
Course Code	BSFT-0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have passed class 12 or equivalent from a recognised board with Physics, Chemistry, and Biology/Home Science as compulsory subjects			**Co-Requisite/s**	Students should have basic knowledge of physics, chemistry and biology.			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕			**SDG (Goals)**	SDG3(Good health and well-being) SDG6(Clean water and sanitation) SDG12(Responsible consuption and production)			

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Familiarization with Food Technology Lab and general laboratory guidelines	Experiments	BL2-Understand	2
2	To determine moisture content in given food sample	Experiments	BL4-Analyze	2
3	To determine ash content in given food sample	Experiments	BL4-Analyze	2
4	To determine crude fat content in given food sample	Experiments	BL4-Analyze	2
5	To determine crude protein content in given food sample	Experiments	BL4-Analyze	2
6	To determine crude fibre content in given food sample	Experiments	BL4-Analyze	2
7	To determine Total Soluble Solids (TSS), pH, and titratable acidity in given samples	Experiments	BL4-Analyze	2
8	To determine physical properties of food grains	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0

Part E

Books	Potter, N. N., & Hotchkiss, J. H. (2012, December 6). Food Science. Springer Science & Business Media.
Articles	https://www.ift.org/news-and-publications/food-technology-magazine
References Books	Vaclavik, V. A., & Christian, E. W. (2007, December 3). Essentials of Food Science. Springer Science & Business Media.
MOOC Courses	https://nptel.ac.in/courses/126105013
Videos	https://youtu.be/i5VwdkggtWU

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	-	-	-	-	-	-	3	1	1
CO2	3	3	2	3	2	1	1	-	-	-	1	-	3	1	1
CO3	3	2	3	3	2	1	1	-	-	-	1	-	3	1	1
CO4	3	2	1	1	1	1	-	-	-	-	-	-	3	3	3
CO5	3	2	2	2	1	1	1	-	-	-	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Microbiology [T]
Course Code	BSFT-0102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have studied Physics, Chemistry, and Biology/Home Science as compulsory subjects			**Co-Requisite/s**	Students should have basic knowledge of microorganisms and their classifications and structures (as studied in biology)			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to Microbiology Laboratory Safety, use of equipment and perform sterilization techniques	Experiments	BL2-Understand	2
2	To study different parts of microscope and its working	Experiments	BL2-Understand	2
3	To prepare culture media (Nutrient broth and agar)	Experiments	BL3-Apply	2
4	To perform simple and Gram's staining	Experiments	BL3-Apply	2
5	To perform different streaking techniques	Experiments	BL5-Evaluate	2
6	To evaluate microbiological quality of water	Experiments	BL5-Evaluate	2
7	To enumerate Lactic acid bacteria from fermented foods	Experiments	BL5-Evaluate	2
8	To examine the microbial load of different food samples	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	

Part E

Books	Frazier, W. C. (1967, January 1). Food Microbiology. McGraw-Hill Companies.
Articles	https://agsci.psu.edu/global/ifsi/ukraine-food-safety-short-course-materials/fssc-case-studies/food-microbiology-case-study.pdf
References Books	Khetarpaul, N. (2006, January 1). Food Microbiology. Daya Books.
MOOC Courses	https://nptel.ac.in/courses/105107173
Videos	https://www.youtube.com/watch?v=zlRXDi-6j-Y&t=2s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	-	-	-	1	-	3	1	1
CO2	3	2	3	3	2	2	-	-	-	-	-	-	3	1	1
CO3	3	2	2	3	3	3	-	-	-	-	-	-	3	1	1
CO4	3	3	2	3	2	2	1	-	-	-	-	-	3	3	3
CO5	3	3	2	2	3	2	-	-	-	-	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Technology of Food Processing and Preservation [T]
Course Code	BSFT-0201 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have studies Introduction to Food Technology and Basic chemistry in previous semester			**Co-Requisite/s**	Knowledge of chemical preservatives used in different foods and processing parameters applied to extend the shelf-life of product			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Familiarization with Food Technology Lab and general laboratory guidelines	Industrial Visit	BL2-Understand	3
2	Study the blanching process and determine catalase/peroxidase activity	Experiments	BL2-Understand	2
3	Study the effect of blanching on vitamin C content in given food sample	Experiments	BL3-Apply	2
4	Examination of the enzymatic browning in fruits and vegetables.	Experiments	BL3-Apply	2
5	Determination of Total Soluble Solids (TSS), pH, and titratable acidity in given samples	Experiments	BL3-Apply	2
6	Preparation of osmotic dehydrated fruits and vegetables	Experiments	BL3-Apply	2
7	Preservation of seasonal fruits/vegetables by natural preservatives	PBL	BL4-Analyze	3
8	Estimation of sodium benzoate in food sample (qualitative and quantitative determination)	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	0

Part E

Books	Khader, V. (2004) Text book on Food Storage and preservation. Ludhiana: Kalyani Publishers.
Articles	
References Books	DESROSIER, N.W. (2018) Technology of Food Preservation. ED-TECH. Fennema, O.R. (1976) Principles of Food Science. New York: Dekker.
MOOC Courses	https://nptel.ac.in/courses/127105231
Videos	https://www.youtube.com/watch?v=vznRdblDl5w&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	1	-	1	1	-	-	3	1	1
CO2	3	2	1	1	1	1	2	1	2	1	-	-	3	1	1
CO3	3	2	2	1	1	-	1	-	-	-	-	-	3	2	2
CO4	3	2	2	2	2	1	1	1	-	1	-	-	3	2	2
CO5	3	2	2	2	2	1	1	-	1	1	-	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Additives [T]
Course Code	BSFT-0202 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Candidates must have studied food chemistry and food microbiology in previous semesters.			**Co-Requisite/s**	Students should have prior knowledge of preservatives, chemical compounds etc.			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To detect different gums and thickeners in food samples	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	0

Part E

Books	Food Additives by Branen AL, Davidson PM & Salminen S
Articles	https://www.researchgate.net/publication/221925228_Food_Additive
References Books	Encyclopedia of Food and Color Additives by Gerorge AB Food Antioxidants: Technological, Toxicological and Health Perspective by Madhavi DL, Deshpande SS & Salunkhe DK. Food Flavours. Part A by Morton ID & Macleod AJ Food Proteins:Processing Applications by Shuryo Nakai Food Polysaccharides and Their Applications by Stephen AM
MOOC Courses	https://nptel.ac.in/courses/126105027
Videos	https://youtu.be/Dm3yP7FF4nI?si=55vFo027nUaRB6jy

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	-	-	-	-	-	-	3	1	1
CO2	3	3	2	2	3	2	-	-	-	-	-	-	3	1	1
CO3	3	3	2	3	3	2	-	-	-	-	-	-	3	1	1
CO4	3	2	2	3	3	3	1	-	-	-	1	-	3	3	3
CO5	3	3	3	2	2	2	1	-	-	-	1	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Processing of Fruits and Vegetables[T]
Course Code	BSFT-0203 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have studies Post-Harvest technology and food preservation in previous semesters			**Co-Requisite/s**	Study of nutritional composition of fruits and vegetables and preparation of value added products			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of jam/ jelly/ marmalade from selected fruit	Experiments	BL3-Apply	2
2	Preparation of RTS beverage	Experiments	BL3-Apply	2
3	Preparation of squash	Experiments	BL3-Apply	2
4	Preparation of grape raisins	Experiments	BL3-Apply	2
5	Preparation of dried fig / banana fig	Experiments	BL3-Apply	2
6	Preparation of fruit candy	Experiments	BL3-Apply	2
7	Osmotic dehydration of fruit slices	Experiments	BL4-Analyze	2
8	Preparation of fruit leather	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	60	18	40	0

Part E

Books	Lal, G., Siddappa, G. S., & Tandon, G. L. (1986, January 1). Preservation of Fruits and Vegetables.
Articles	
References Books	Manay, N. S., & Shadaksharaswamy, M. (2008, January 1). Food: Facts and Principles. New Age International. Ranganna, S. (1986, January 1). Handbook of Analysis and Quality Control for Fruit and Vegetable Products. Tata McGraw-Hill Education Vere Cruess, W. (1938, January 1). Commercial Fruit and Vegetable Products.
MOOC Courses	https://nptel.ac.in/courses/126105015
Videos	https://www.youtube.com/watch?v=k1a2PSEXahM&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	1	-	1	-	1	-	-	3	1	1
CO2	2	1	1	-	1	1	1	1	-	-	1	-	3	1	2
CO3	2	2	2	1	1	1	1	1	1	1	1	-	3	2	2
CO4	2	2	2	2	2	1	1	1	-	-	1	-	3	2	3
CO5	2	2	2	1	1	1	-	-	1	-	1	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Unit Operation [T]
Course Code	BSFT-0302 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic concepts of Physics, Chemistry & Mathematics			**Co-Requisite/s**	To be familiar with the basic concepts of technology of processing of fruits and vegetables			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Unit Operations of Chemical Engineering: McCabe, Smith and Harriot, TMH, 5th edition
Articles	
References Books	Transport Processes and Unit operations: Geankopolis, PHI, 3rd edition Unit operations and unit processes for Engineers and Biologists; B. C. Bhattacharya and C. M. Narayanan; Khanna Publications, Delhi
MOOC Courses	https://nptel.ac.in/courses/103107088
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	-	1	1	-	-	1	1	-	1	1	1
CO2	1	1	1	-	-	-	-	1	-	-	-	-	1	1	1
CO3	2	1	2	-	1	2	-	1	-	1	1	-	2	1	2
CO4	2	2	2	-	-	2	-	-	-	-	-	-	2	2	2
CO5	3	2	2	1	-	1	-	1	-	1	2	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Processing of spices and plantation crops [T]
Course Code	BSFT-0303 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	candidates must have passed class 12 or equivalent from a recognised board with Physics, Chemistry, and Biology/Home Science as compulsory subjects and an overall grade of at least 50%			**Co-Requisite/s**	Student should have basic knowledge about plants, their morphology and anatomy.			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG10(Reduced inequalities) SDG12(Responsible consuption and production) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To estimate 1000 kernel weight, bulk density, true density and porosity of given sample of grains	Experiments	BL2-Understand	2
2	To determine coefficient of friction and angle of repose of given grain samples	Experiments	BL4-Analyze	2
3	To determine the caffeine content in given samples of tea and coffee	Experiments	BL5-Evaluate	2
4	To prepare decaffeinated tea	Experiments	BL6-Create	2
5	To determine the adulteration of spices	Experiments	BL4-Analyze	2
6	To prepare the essential oil from spices	Experiments	BL6-Create	2
7	To prepare masala pre-mix for culinary uses	Experiments	BL6-Create	2
8	To perform grading of different kind of tea	Experiments	BL5-Evaluate	2
9	To prepare chocolate based food product	Experiments	BL6-Create	2
10	To visit a related industry	Industrial Visit	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Spices, condiments and seasonings-Kenneth T. Farrell
Articles	https://www.researchgate.net/profile/Gangaiah-Bandla/publication/349075652_AN_OVERVIEW_OF_INTEGRATED_FARMING_SYSTEMS_OF_COASTAL_INDIA/links/6020d8a7299bf1cc26ae8793/AN-OVERVIEW-OF-INTEGRATED-FARMING-SYSTEMS-OF-COASTAL-INDIA.pdf#page=25
References Books	Tea Production and Processing-Banerjee B. Spice Science and Technology -Kenji Hirasa and MitsnoTakemasa Chocolate, Cocoa and Confectionery Technology. -Minifie BW Handbook on Spices. National Institute of Industrial Research Board, -NIIR Coffee Processing Technology-Sivetz M & Foote HE
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ag13/preview
Videos	https://www.youtube.com/watch?v=-NyDCWuAGfk&embeds_referring_euri=https%3A%2F%2Fonlinecourses.nptel.ac.in%2F&source_ve_path=Mjg2NjY&feature=emb_logo

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	1	1	-	-	-	1	1	3	1	1
CO2	3	3	3	2	2	2	-	-	-	-	-	2	3	1	1
CO3	3	2	3	3	3	1	-	-	-	-	-	1	3	1	1
CO4	2	2	2	2	3	3	-	-	-	-	-	3	3	3	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Beverage Technology [T]
Course Code	BSFT-0401 [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have studies food microbiology and introduction to food technology in previous semester			**Co-Requisite/s**	knowledge of food fermentation and preservation			
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Determination of Quality parameters of bottled water	Experiments	BL2-Understand	3
2	Brewing perfect French press coffee from roasted coffee beans	Experiments	BL2-Understand	2
3	Preparation of fruit smoothies	Experiments	BL3-Apply	2
4	Preparation of nectar and cordials	Experiments	BL3-Apply	2
5	Determination of TSS, pH and titratable acidity of different beverages	Experiments	BL3-Apply	2
6	Determination of the caffeine level in stimulating beverages	Experiments	BL3-Apply	2
7	Preparation of Alcoholic beverages	Experiments	BL3-Apply	3
8	Preparation of coconut water energy drink	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	0

Part E

Books	Manay, N.S. and Shadaksharaswamy, M. (2008) Foods: Facts and principles. New Delhi: New Age International Ltd.
Articles	
References Books	Mudgil, D. and Barak, S. (2018) Beverages: Processing and technology. Jodhpur, India: Scientific Publishers. Varnam, A.H. and Sutherland, J.R. (2009) Beverages: Technology, Chemistry and Microbiology. Londos €tc.: Chapman and Hall.
MOOC Courses	https://nptel.ac.in/courses/126105020
Videos	https://www.youtube.com/watch?v=h5NpTku5BGc

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	1	-	1	1	1	-	-	3	1	1
CO2	3	2	1	1	1	1	1	-	1	-	-	-	3	1	1
CO3	3	2	2	2	1	1	1	1	1	1	-	-	3	1	1
CO4	3	2	2	1	1	1	1	-	1	1	-	-	3	2	2
CO5	3	2	2	2	1	1	1	1	1	1	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Livestock product technology [T]
Course Code	BSFT-0403 [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have studied food processing and preservation, food nutrition and related subjects in previous semester			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the structure of an egg	Experiments	BL2-Understand	2
2	To determine the specific gravity of eggs	Experiments	BL5-Evaluate	2
3	To study the process of osmosis by the removal of egg shell	Experiments	BL4-Analyze	2
4	To determine the exterior and interior quality (breakout method) of table eggs.	Experiments	BL4-Analyze	2
5	To determine egg quality using candling	Experiments	BL4-Analyze	2
6	Preparation of an egg/chicken pickle and its sensory evaluation	Experiments	BL6-Create	2
7	Determination of water holding capacity of meat	Experiments	BL5-Evaluate	2
8	Determination of extract release volume (ERV) of meat	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Outlines of meat science and technology by B.D Sharma
Articles	
References Books	Poultry Meat and Egg Production by Parkhurst and Mountney
MOOC Courses	https://nptel.ac.in/courses/127106236
Videos	https://www.youtube.com/watch?v=i5VwdkggtWU

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	1	-	-	-	-	-	-	3	1	1
CO2	3	3	2	1	2	1	-	-	1	-	-	1	3	1	1
CO3	2	3	3	2	2	2	1	-	1	-	1	2	3	1	1
CO4	1	2	3	2	2	3	1	-	1	-	1	1	3	3	3
CO5	1	3	2	-	2	1	-	-	1	-	-	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Dairy Technology [T]
Course Code	BSFT-0501 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	candidates must have passed class 12 or equivalent from a recognised board with Physics, Chemistry, and Biology/Home Science as compulsory subjects and an overall grade of at least 50%			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG12(Responsible consuption and production)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To perform platform tests in milk.	Experiments	BL2-Understand	2
2	To estimate milk protein by Folin method.	Experiments	BL4-Analyze	2
3	To estimate milk fat by Gerber method.	Experiments	BL5-Evaluate	2
4	Preparation of flavored milk.	Experiments	BL6-Create	2
5	Pasteurization of milk	Experiments	BL3-Apply	2
6	To prepare casein and calculate its yield	Experiments	BL6-Create	2
7	Learning objective To prepare yoghurt from different sources of milk and conduct its sensory evaluation. Learning This project will help students to learn the preparation of yoghurt and also the principle of sensory evaluation	PBL	BL6-Create	2
8	Significance of lactose in industry	Seminar	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	0

Part E

Books	
Articles	https://www.frontiersin.org/articles/10.3389/fanim.2021.760310/full
References Books	De Sukumar Outlines of Dairy Technology, Oxford University Press, Oxford. 2007. Webb and Johnson, Fundamentals of Dairy Chemistry
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ag15/preview
Videos	https://www.youtube.com/watch?v=8MCm0-ncgos&t=4s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	1	-	1	-	3	1	1
CO2	1	1	2	1	-	-	1	1	-	1	-	-	3	1	1
CO3	2	1	1	1	-	1	-	-	1	-	1	-	3	1	1
CO4	3	2	1	1	1	-	1	1	-	1	-	-	3	3	3
CO5	3	2	2	2	2	2	1	1	1	-	2	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Sensory Evaluation [T]
Course Code	BSFT-0502 [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students should have studied food additives and food chemistry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Use nine-point hedonic scale for sensory evaluation	Experiments	BL2-Understand	2
3	Preparation of dilution sample for sensory evaluation	Experiments	BL3-Apply	2
4	Threshold test in different food products	Experiments	BL3-Apply	2
5	Estimation of crude fibre in the food sample	Experiments	BL4-Analyze	2
6	Estimation of color properties in food sample	Experiments	BL4-Analyze	2
7	Determination of textural changes by different unit operations	Experiments	BL4-Analyze	2
8	Extraction of pomace from fruits	Experiments	BL3-Apply	2
9	Extraction of pigments from fruits and vegetables	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	0

Part E

Books	Potter, N. N., & Hotchkiss, J. H. (2012, December 6). Food Science. Springer Science & Business Media.
Articles	
References Books	Lal, G., Siddappa, G. S., & Tandon, G. L. (1986, January 1). Preservation of Fruits and Vegetables. Sanjeev, S. R. P. K., & Kumar, S. (2002, November 30). Fruit and Vegetable Preservation.
MOOC Courses	https://nptel.ac.in/courses/126103017
Videos	https://www.youtube.com/watch?v=F8jhoaV-nsE&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	-	1	-	1	-	1	-	-	3	1	1
CO2	3	1	1	-	-	1	-	-	-	-	1	-	3	1	1
CO3	3	2	1	1	-	1	1	-	-	-	-	-	3	1	2
CO4	3	1	3	-	-	1	-	1	-	1	-	-	3	1	2
CO5	3	2	3	-	-	1	-	-	-	-	1	-	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food product/processing waste management [T]
Course Code	BSFT-0601 [T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have studied subjects- processing of cereals and pulses, fruits and vegetables, technology of flesh foods, dairy technology in the previous semesters			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG6(Clean water and sanitation)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Production of Banana fiber from banana pseudo-stem	Experiments	BL3-Apply	2
2	Production of ethyl alcohol from molasses	Experiments	BL4-Analyze	2
3	Extraction of polyphenols from fruit and vegetable peels	Experiments	BL4-Analyze	2
4	Isolation of starch from mango kernels	Experiments	BL4-Analyze	2
5	Extraction of pectin from fruit waste	Experiments	BL4-Analyze	2
6	Extraction of oil from citrus peel	Experiments	BL4-Analyze	2
7	Preparation of candied orange peel	Experiments	BL3-Apply	2
8	Preparation of fiber rich cookies	PBL	BL3-Apply	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	0

Part E

Books	Wang, L. K., Hung, Y. T., Lo, H. H., & Yapijakis, C. (2005, September 29). Waste Treatment in the Food Processing Industry.
Articles	
References Books	Green, J. H., & Kramer, A. (1979, January 1). Food Processing Waste Management. A V I Publishing Company.
MOOC Courses	https://nptel.ac.in/courses/105105350
Videos	https://www.youtube.com/watch?v=Ee8RqLKgGUg&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	-	1	1	2	1	1	1	-	3	1	1
CO2	2	1	1	1	1	-	1	-	1	-	-	-	3	1	2
CO3	3	1	1	-	-	1	-	2	1	1	-	-	3	1	2
CO4	3	2	1	1	1	2	1	-	-	-	2	-	3	2	3
CO5	3	2	1	1	1	2	-	1	-	1	1	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Laws and Regulations [T]
Course Code	BSFT-0602 [T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of food laws and regulations			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Patricia A. Curtis; Food Laws and Regulations by Blackwell publisher
Articles	
References Books	Kiron Prabhakar; A Practical Guide to Food Laws and Regulations ISA; HACCP & ISO-22000. ISO9000-01
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	1	1	1	1	-	1	2	1
CO2	1	2	1	2	1	1	2	1	2	1	-	-	1	2	1
CO3	2	2	2	2	2	1	2	2	2	1	1	-	2	3	2
CO4	2	3	2	2	2	2	1	1	2	1	-	-	2	3	2
CO5	3	3	3	2	3	2	1	2	1	1	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Packaging [T]
Course Code	BSFT-0603 [T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have studied about different food products, and their physiochemical properties			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Identification of different types of packaging and packaging materials	Experiments	BL3-Apply	2
2	To perform different destructive tests for glass containers	Experiments	BL4-Analyze	2
3	Measurement of thickness of packaging materials	Experiments	BL4-Analyze	2
4	Determination of water-vapour transmission rate	Experiments	BL4-Analyze	2
5	Testing of chemical resistance of packaging materials	Experiments	BL4-Analyze	2
6	To perform sterilization of different packaging materials	Experiments	BL4-Analyze	2
7	To determine leakage of plastic pouches	Experiments	BL4-Analyze	2
8	To determine the basis weight, density and grammage of paper and paper board	Experiments	BL4-Analyze	2
9	To determine the wax content in given sample of wax paper	Experiments	BL4-Analyze	2
10	Visit to relevant industries	Industrial Visit	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	

Part E

Books	Paine, F. A., & Paine, H. Y. (2012, December 6). A Handbook of Food Packaging. Springer Science & Business Media.
Articles	
References Books	Sacharow, S., & Griffin, R. C. (1980, January 1). Principles of Food Packaging. Avi Publishing Company.
MOOC Courses	https://nptel.ac.in/courses/127106237
Videos	https://www.youtube.com/watch?v=0b3As1QHvk8

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	1	-	1	-	1	-	3	1	1
CO2	3	1	1	1	1	-	1	-	-	1	-	-	3	1	1
CO3	3	1	1	-	-	-	2	1	-	2	2	-	3	1	2
CO4	3	2	1	1	1	-	2	-	1	-	-	-	3	1	2
CO5	3	2	1	-	-	1	2	1	2	1	2	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Product Development and Formulation [T]
Course Code	BSFT-0701 [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	students to pass 10+2 with a minimum aggregate of 50% from the science stream with mandatory subjects like PCMB (Physics, Chemistry, Maths, Biology).			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of high fibre bread.	Experiments	BL6-Create	2
2	Preparation of high fibre biscuits	Experiments	BL6-Create	2
3	Preparation of high fibre cake	Experiments	BL6-Create	2
4	Preparation of nutritious beverages	Experiments	BL6-Create	2
5	Preparation of functional foods for obese person.	Experiments	BL6-Create	2
6	Preparation of functional foods for aged persons	Experiments	BL6-Create	2
7	Preparation of hypocholesterolmic foods	Experiments	BL6-Create	2
8	Preparation of low sodium foods	Experiments	BL6-Create	2
9	Preparation of foods for underweight persons	Experiments	BL6-Create	2
10	Preparation of fortified atta	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	New food product development: From concept to market place.-Gordon W. Fuller
Articles	https://www.sciencedirect.com/science/article/abs/pii/0924224494900175
References Books	Basic Food Preparation-A complete Manual-Raina et.al. Foods: Facts and Principles-Manay, S. and Shadaksharaswami, M. Breakfast Cereals and How They are Made?-R.B. Fast and E.F.Caldwell
MOOC Courses	https://nptel.ac.in/courses/126105015
Videos	https://www.youtube.com/watch?v=k1a2PSEXahM

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	2	1	-	1	-	-	1	1	3	1
CO2	3	3	2	3	3	3	-	-	1	-	-	-	2	3	1
CO3	3	2	2	3	3	2	-	-	1	-	-	-	2	3	1
CO4	2	2	3	3	3	3	2	-	1	-	2	3	3	3	3
CO5	2	3	3	2	2	2	2	-	1	-	2	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Fermentation technology [T]
Course Code	BSFT-0702 [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Student must have studied food microbiology and dairy technology in previous semester.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG6(Clean water and sanitation) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of Yoghurt	Experiments	BL4-Analyze	2
2	Preparation of whey based fermented beverage	Experiments	BL4-Analyze	2
3	Preparation of pickles	Experiments	BL4-Analyze	2
4	Preparation and maintenance of starter cultures	Experiments	BL4-Analyze	2
5	Preparation of Sauerkraut	Experiments	BL4-Analyze	2
6	Preparation of Bread	Experiments	BL4-Analyze	2
7	Preparation of wine	PBL	BL5-Evaluate	3
8	Preparation of Cheese	PBL	BL5-Evaluate	3
9	Preparation of tofu	Experiments	BL4-Analyze	2
10	Preparation of vinegar	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	

Part E

Books	Industrial Microbiology by A. H. Patel
Articles	https://www.sciencegate.app/document/10.1016/b978-0-12-821292-9.00026-1
References Books	Microbial Biotechnology: Fundamentals of Applied Microbiology - A. N. Glazer and H. Nikaido Principles of Fermentation Technology by PF Stanbury Dr Whitaker
MOOC Courses	https://nptel.ac.in/courses/102105087
Videos	https://youtu.be/m27ouF6xfZg?si=ywlB2EfJDtUFuCek

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	1	-	1	-	-	-	2	1	1
CO2	2	2	1	1	1	-	1	-	-	-	-	-	2	2	2
CO3	2	2	2	2	1	1	-	1	-	1	1	-	3	2	3
CO4	3	3	2	2	1	-	1	-	-	-	-	-	3	2	3
CO5	3	3	2	2	1	-	1	-	1	-	-	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food refrigeration and cold storage [T]
Course Code	BSFT-0703a [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Student must have studied food processing and preservation in previous semester			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Raymond R. Gunther- Refrigeration, Air Conditioning and Cold Storage
Articles	
References Books	Clive D.J. Dellino- Cold and Chilled Storage Technology S. Domkundwar & Subhash Arora- Cold Storage & Freezer Storage Technology
MOOC Courses	https://nptel.ac.in/courses/126105025
Videos	https://youtu.be/Y1oM3AYhtyA?si=5ZBDE0ow5kMWDExx

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	-	2	2	2	-
CO2	1	1	1	1	-	1	1	-	-	1	-	2	2	2	-
CO3	2	2	2	1	1	1	-	1	-	-	-	3	2	2	-
CO4	2	2	2	1	-	-	-	-	-	-	-	3	2	3	-
CO5	3	2	2	1	1	-	1	1	-	1	1	3	2	3	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Novel food processing techniques [T]
Course Code	BSFT-0802 [T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	Students must have studied food processing and preservation in previous semester			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓	**SDG (Goals)**	SDG3(Good health and well-being) SDG6(Clean water and sanitation) SDG9(Industry Innovation and Infrastructure)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Da-Wen Sun- Emerging Technologies for Food Processing.
Articles	
References Books	M. P. Cano, M. S. Tapia, and G. V.- Novel Food Processing Technologies Howard Q. Zhang. et al., Nonthermal Processing Technologies for Food
MOOC Courses	https://nptel.ac.in/courses/126105015
Videos	https://youtu.be/k1a2PSEXahM?si=5fmJz3BaChiLsDGr

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	-	-	-	-	1	1	-	2	2	2
CO2	2	1	2	1	-	1	1	-	1	-	-	-	2	2	2
CO3	3	2	2	2	1	1	1	1	-	1	-	-	3	2	3
CO4	3	2	2	2	-	-	-	-	-	-	-	-	3	3	3
CO5	3	2	2	2	1	1	1	1	1	-	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Legumes and oilseeds Technology [T]
Course Code	BSFT-0803a [T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Students must have studied processing of cereals, pulses and oilseeds in previous semester.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To determine the physical properties of legumes and oil seeds.	Experiments	BL4-Analyze	2
2	To determine the nutritional quality of selected pulses and oilseeds.	Experiments	BL4-Analyze	2
3	To study the preconditioning of pulses and oilseeds before milling	Experiments	BL4-Analyze	2
4	To study the removal of anti-nutritional compounds from selected pulses and oilseeds	Experiments	BL4-Analyze	2
5	To study the cooking quality of dhal	Experiments	BL5-Evaluate	2
6	To develop a composite legume mix and prepare a value added product.	Experiments	BL5-Evaluate	2
7	To prepare soya milk and groundnut milk	PBL	BL6-Create	3
8	To prepare soya sauce	PBL	BL6-Create	3
9	To prepare value added food products from deoiled cake	PBL	BL6-Create	3
10	To extract oil using solvent extraction method from oilseeds	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	

Part E

Books	Chakraverty A., Post harvest technology of cereals: pulses and oilseeds
Articles	
References Books	Kay DE, Food Legumes
MOOC Courses	https://nptel.ac.in/courses/103105460
Videos	https://youtu.be/eJBjEjnH4eo?si=vuiZ7dqrs1UU0Mc7

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	-	1	1	-	-	1	1	-	3	2	1
CO2	2	2	1	1	1	-	1	1	-	-	-	-	3	2	1
CO3	2	2	1	1	1	1	1	1	-	1	-	-	3	3	2
CO4	3	3	2	1	1	-	1	-	1	-	-	-	3	3	3
CO5	3	3	2	1	-	1	1	1	1	1	1	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Chemistry [T]
Course Code	BSFT0103[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have the basic knowledge of Physical ,Inorganic and Organic chemistry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To get familiarize with Food Technology Laboratory glasswares, instruments and general laboratory guidelines	PBL	BL2-Understand	3
2	To prepare and standardize the chemical solutions	Experiments	BL2-Understand	2
3	To determine moisture content in given food sample	Experiments	BL3-Apply	2
4	To determine ash content in given food sample	Experiments	BL3-Apply	2
5	To determine crude fat content in given food sample	Experiments	BL3-Apply	2
6	To determine crude protein content in given food sample	Experiments	BL3-Apply	2
7	To determine crude fibre content in given food sample	Experiments	BL3-Apply	2
8	To determine the titratable acidity and pH in given food sample	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	0

Part E

Books	Osgood, M., Ocorr, K.A. and Lehninger, A.L. (2000a) The absolute, ultimate guide to lehninger's principles of Biochemistry, third edition: Study guide and solutions manual. New York: Worth Publishers.
Articles	https://network.bepress.com/life-sciences/food-science/food-chemistry/
References Books	Harpers Illustrated Biochemistry (2015a). Erscheinungsort nicht ermittelbar: McGraw-Hill Professional. Stryer, L., Tymoczko, J.L. and Berg, J.M. (2002) Biochemistry. New York: W.H. Freeman.
MOOC Courses	https://nptel.ac.in/courses/126105027
Videos	https://www.youtube.com/watch?v=Dm3yP7FF4nI&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	1	-	1	1	-	1	-	-	1	1	1
CO2	2	1	1	1	-	1	-	1	1	1	-	-	1	1	1
CO3	2	2	2	1	1	1	1	1	1	1	-	-	1	1	2
CO4	3	2	2	2	1	2	1	1	2	1	-	-	1	2	2
CO5	3	2	2	2	1	1	2	1	1	1	-	-	1	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Calculus and Differential Equations
Course Code	BSMA0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	calculus and differential equations include a strong foundation in algebra, trigonometry, pre-calculus, and analytical geometry. Understanding of functions, limits, and basic calculus concepts like derivatives and integrals is essential for success in these subjects.			calculus and differential equations include a strong foundation in algebra, trigonometry, pre-calculus, and analytical geometry. Understanding of functions, limits, and basic calculus concepts like derivatives and integrals is essential for success in these subjects.			**Co-Requisite/s**	
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	G. F. Simmons Differential Equations Tata McGraw Hill, 1972.
Articles	
References Books	H. T. H. Piaggio Elementary Treatise on Differential Equations and their Application C.B.S. Publisher & Distributors, Delhi, 1985
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma12/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma12/preview https://onlinecourses.nptel.ac.in/noc24_ma20/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Calculus and Differential Equations
Course Code	BSMA0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	calculus and differential equations include a strong foundation in algebra, trigonometry, pre-calculus, and analytical geometry. Understanding of functions, limits, and basic calculus concepts like derivatives and integrals is essential for success in these subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	12
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	G. F. Simmons Differential Equations Tata McGraw Hill, 1972.
Articles	
References Books	H. T. H. Piaggio Elementary Treatise on Differential Equations and their Application C.B.S. Publisher & Distributors, Delhi, 1985
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma12/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma12/preview https://onlinecourses.nptel.ac.in/noc24_ma20/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Abstract Algebra
Course Code	BSMA0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basic Knowledge of Set theory and Basic understanding of elementary mathematics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	I. N. Herstein, Topics in Algebra Wiley Eastern Ltd. New Delhi,
Articles	
References Books	Shantinarayan A Text Book of Modern Abstract Algebra S. Chand and Company, New Delhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma06/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma06/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	3	-	-	-	-	1	-	-	-	-	-	-
CO2	1	-	-	2	-	-	-	-	1	-	-	-	-	-	-
CO3	-	2	-	-	1	-	-	-	-	2	-	-	-	-	-
CO4	2	-	1	-	-	-	-	2	-	-	-	-	-	-	-
CO5	1	-	-	2	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Abstract Algebra
Course Code	BSMA0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basic Knowledge of Set theory and Basic understanding of elementary mathematics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	I. N. Herstein, Topics in Algebra Wiley Eastern Ltd. New Delhi,
Articles	
References Books	Shantinarayan A Text Book of Modern Abstract Algebra S. Chand and Company, New Delhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma06/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma06/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	3	-	-	-	-	1	-	-	-	-	-	-
CO2	1	-	-	2	-	-	-	-	1	-	-	-	-	-	-
CO3	-	2	-	-	1	-	-	-	-	2	-	-	-	-	-
CO4	2	-	1	-	-	-	-	2	-	-	-	-	-	-	-
CO5	1	-	-	2	-	-	-	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Vector Analysis & Linear Algebra
Course Code	BSMA0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basic knowledge of Matrix & vectors			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. K.B. Datta, Matrix and Linear Algebra, Pratice Hall of India Pvt. Ltd. New Delhi, 2000 2. K. Haffiman and R. Kunze, Linear Algebra, 2nd Edition. Prentice Hall Englewood Cliffs. New Jersey,1971 N. Saran and S. N. Nigam,Introduction to Vector Analysis,Pothishala Pvt. Ltd. Allahabad
Articles	
References Books	1. Marc Lipson and Seymour Lipschutz, Schaum'S Outline Of Linear Algebra, Key College Publishing (Springer – Verlag) 2001 2. S, Kumarsaran, Linear Algebra, A Bermetric Approach Prentice Hall of India, 2000 Shanti Narayan,A Text Book of Vector Calculus,S. Chand & Co. New Delhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma13/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma04/preview https://onlinecourses.nptel.ac.in/noc24_ee48/preview https://onlinecourses.nptel.ac.in/noc24_ma11/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	-	-	-
CO2	3	3	1	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Vector Analysis & Linear Algebra
Course Code	BSMA0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basic knowledge of Matrix & vectors			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. K.B. Datta, Matrix and Linear Algebra, Pratice Hall of India Pvt. Ltd. New Delhi, 2000 2. K. Haffiman and R. Kunze, Linear Algebra, 2nd Edition. Prentice Hall Englewood Cliffs. New Jersey,1971 N. Saran and S. N. Nigam,Introduction to Vector Analysis,Pothishala Pvt. Ltd. Allahabad
Articles	
References Books	1. Marc Lipson and Seymour Lipschutz, Schaum'S Outline Of Linear Algebra, Key College Publishing (Springer – Verlag) 2001 2. S, Kumarsaran, Linear Algebra, A Bermetric Approach Prentice Hall of India, 2000 Shanti Narayan,A Text Book of Vector Calculus,S. Chand & Co. New Delhi
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma13/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma04/preview https://onlinecourses.nptel.ac.in/noc24_ee48/preview https://onlinecourses.nptel.ac.in/noc24_ma11/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	-	-	-
CO2	3	3	1	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	1	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Advance Calculus and Differential equations
Course Code	BSMA0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basics Differentiation , Integrations, , Continuity ,convergence and divergence of Sequence and Series ,partial differentiation			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	R. R. Goldbeg,Real Analysis,Oxford & I. B. H. Publishing Co. New Delhi Sharma and Gupta ,Integral Transform,Pragati, Prakashan Meerut
Articles	
References Books	D. Soma Sundaram and B. Choudhary,A first Course in Mathematical Analysis,Narosa Publishing House, New Delhi, 1997 D. A. Murray,Introductory Course in Differential Equation,Orient Longman, India, 1967.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	2	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	1	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Advance Calculus and Differential equations
Course Code	BSMA0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Basics Differentiation , Integrations, , Continuity ,convergence and divergence of Sequence and Series ,partial differentiation			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	R. R. Goldbeg,Real Analysis,Oxford & I. B. H. Publishing Co. New Delhi Sharma and Gupta ,Integral Transform,Pragati, Prakashan Meerut
Articles	
References Books	D. Soma Sundaram and B. Choudhary,A first Course in Mathematical Analysis,Narosa Publishing House, New Delhi, 1997 D. A. Murray,Introductory Course in Differential Equation,Orient Longman, India, 1967.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	2	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	1	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Computer Oriented Statistical Methods
Course Code	BSMA0501[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Understanding of algebra, basic calculus, and probability theory. Familiarity with descriptive statistics, such as measures of central tendency and dispersion, is necessary. Basic computer skills are helpful for using statistical software like R or Python. Critical thinking, problem-solving, and logical reasoning skills are essential for analyzing data and drawing valid conclusions. Continuous learning and practice are crucial in statistics due to its dynamic nature.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	H. C. Saxena and J. N. Kapoor Mathematical Statistics S. Chand and sons Co.
Articles	
References Books	M. Ray Statistical Methods Ram Prasad Publication
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ec03/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ec03/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	-	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BSc_PCM

Title of the Course	Computer Oriented Statistical Methods
Course Code	BSMA0501[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Understanding of algebra, basic calculus, and probability theory. Familiarity with descriptive statistics, such as measures of central tendency and dispersion, is necessary. Basic computer skills are helpful for using statistical software like R or Python. Critical thinking, problem-solving, and logical reasoning skills are essential for analyzing data and drawing valid conclusions. Continuous learning and practice are crucial in statistics due to its dynamic nature.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	H. C. Saxena and J. N. Kapoor Mathematical Statistics S. Chand and sons Co.
Articles	
References Books	M. Ray Statistical Methods Ram Prasad Publication
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ec03/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ec03/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	-	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Immunology
Course Code	BSMB 202(T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	This course will introduce to the applied aspects of immunology in disease detection and diagnosis			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Anatomical view of mammalian thymus and various immune organs	Experiments	BL3-Apply	2
VIII	Study about Covaxin vaccine administration in local area and effect visualized	Internships	BL4-Analyze	15 DAYS
4	To perform Radial immune diffusion	Experiments	BL3-Apply	2
5	To perform Double immuno diffusion	Experiments	BL3-Apply	2
6	Haemoglobin detection by given Blood Sample	Experiments	BL3-Apply	2
VII	Detection of Hb% of human population in locality and relate to their nutrition diet.	PBL	BL4-Analyze	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Immunology by Kindt, Goldsby, Osborne, 4th Edition
Articles	https://njms.rutgers.edu/sgs/olc/mci/prot/2009/Hypersensitivities09.pdf
References Books	Essentials Immunology, Ivam M Roitt, 12th Edition
MOOC Courses	https://nptel.ac.in/courses/104108055
Videos	https://nptel.ac.in/courses/104108055

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	2	2	-	1	-	-	-	-	-	1	2	2
CO2	1	2	2	3	1	3	1	-	-	-	-	-	1	2	2
CO3	1	2	1	2	1	2	2	-	-	-	-	-	1	2	2
CO4	1	2	1	2	1	2	2	-	-	-	-	-	3	3	3
CO5	1	2	2	1	2	-	2	-	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Analytical Chemistry
Course Code	BSMB 203 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of Fundamentals of Analytical Chemistry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Complexometric titration	Experiments	BL3-Apply	4
VIII	Qualitative Analysis using Thin Layer Chromatography	PBL	BL4-Analyze	6
IX	Purification of sample by Crystallization technique	PBL	BL6-Create	7
IV	To determine the Percentage of Copper in copper alloy solution	Experiments	BL3-Apply	2
V	To determine the percentage of Chromium in chrome alloy	Experiments	BL3-Apply	2
VI	To purify the given sample Ammonium Chloride	Experiments	BL3-Apply	
VII	Qualitative Analysis using Paper, Chromatography	PBL	BL4-Analyze	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Y Anjaneyulu Textbook of Analytical Chemistry 2008
Articles	https://nptel.ac.in/courses/104105084
References Books	Skoog D.A. and West D.M. Saunders Fundamental of Analytical Chemistry Ninth Edition
MOOC Courses	https://nptel.ac.in/courses/104105084
Videos	https://nptel.ac.in/courses/104105084

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	-	-	3	3	2
CO2	3	3	1	-	-	-	-	-	-	-	-	-	3	2	1
CO3	3	1	-	2	-	-	-	-	-	-	-	-	1	1	2
CO4	2	3	-	-	-	-	-	-	-	-	-	-	1	1	2
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Bacteriology, mycology and Virology
Course Code	BSMB 601(T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	characteristics of bacterial cells, cell organelles, cell wall composition and various appendages like capsules, flagella or pili.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Mushroom Cultivation	Experiments	BL6-Create	12
2	Isolation of Bacterial Colony by Streaking Plate method	Experiments	BL2-Understand	3
3	Isolation of Bacterial Colony by Pour Plate method	Experiments	BL2-Understand	3
4	Isolation of Bacterial Colony by Serial dilution Plate method	Experiments	BL2-Understand	3
5	Endospore Staining	Experiments	BL2-Understand	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Pelczar,M.J.Chan,E.C.S. and Krieg,N.R.(1986).Microbiology, Vth Eds.,Mc .Graw Hill.
Articles	https://www.researchgate.net/publication/313745331_Plant_Pathogenic_Fungi
References Books	Modern Microbial Genetics by U.N.Streips and R.E. Yasbin, 2nd edition; Wiley Publishers;2002.
MOOC Courses	https://nptel.ac.in/courses/102105087
Videos	https://nptel.ac.in/courses/102105087

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	3	3	1	2	1	3	1	2	2	3
CO2	2	1	2	2	1	3	3	2	1	1	3	1	2	3	2
CO3	1	2	1	1	1	3	3	2	1	2	3	2	3	2	3
CO4	2	3	2	3	3	1	1	1	2	1	1	2	2	1	2
CO5	2	3	2	3	3	2	2	1	1	1	1	1	2	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Food and Dairy Microbiology
Course Code	BSMB 602 (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Staining of microorganisms	Experiments	BL3-Apply	2
2	Composition, preparation and sterilization of media	Experiments	BL3-Apply	2
3	Demonstration of techniques for pure culture of microorganisms	Experiments	BL4-Analyze	2
4	Streak plate method	Experiments	BL3-Apply	2
5	Pour plate method.	Experiments	BL3-Apply	2
6	Serial dilution agar plate method	Experiments	BL4-Analyze	2
7	Microbiology testing of milk	PBL	BL4-Analyze	2
8	Serial dilution agar plate method	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Virendra Kumar Pande Textbook of Food Microbiology 1st Edition
Articles	https://academic.oup.com/jimb
References Books	John C. Ayres Microbiology of Foods 2nd Edition Frazier, W.C. Food Microbiology 4th edition Pelzar, H.J. and Rober, D. Microbiology 5th edition
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ag03/preview https://onlinecourses.nptel.ac.in/noc23_ag02/preview https://nptel.ac.in/courses/126105015 https://onlinecourses.nptel.ac.in/noc24_ag07/preview
Videos	https://nptel.ac.in/courses/102105058

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	2	1	-	-	-	-	-	2	3	1	2
CO2	2	2	1	3	1	3	2	-	-	-	-	2	1	2	1
CO3	1	1	2	2	2	1	2	3	-	-	-	1	3	3	2
CO4	3	2	3	3	1	1	3	2	-	-	-	1	2	3	1
CO5	2	3	3	2	3	2	1	2	-	-	-	3	1	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Microbial Genetics
Course Code	BSMB 701 (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Students should be aware about the cell structures of microrganisms, thier growth and development process and genetic behaviour			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Study of different types of DNA and RNA using micrographs and model / schematic representations.	Experiments	BL2-Understand	2
II	Study of semi-conservative replication of DNA through micrographs / schematic representations.	Experiments	BL2-Understand	2
III	Resolution and visualization of DNA by Agarose Gel Electrophoresis	Experiments	BL4-Analyze	6
IV	Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).	PBL	BL3-Apply	6
V	Study the effect of chemical (HNO2) and physical (UV) mutagens on bacterial cells.	PBL	BL4-Analyze	5
VI	Study survival curve of bacteria after exposure to ultraviolet (UV) light	PBL	BL4-Analyze	6
VII	Demonstration of Bacterial Transformation and calculation of transformation efficiency.	PBL	BL2-Understand	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Sambrook J and Russell DW. (2001). Molecular Cloning: A Laboratory Manual. 4th Edition, Cold Spring Harbour Laboratory press
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9315481/
References Books	Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication Becker WM, Kleinsmith LJ, Hardin J and Bertoni GP (2009) The World of the Cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco. Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
MOOC Courses	https://onlinecourses.swayam2.ac.in/cec22_bt05/preview
Videos	https://onlinecourses.swayam2.ac.in/cec22_bt05/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	-	-	-	-	-	-	2	2	1
CO2	2	1	3	2	1	2	1	-	-	-	-	-	1	1	1
CO3	1	1	3	1	1	2	3	-	-	-	-	-	1	1	1
CO4	1	2	1	2	2	1	3	-	-	-	-	-	3	2	3
CO5	2	2	1	1	3	1	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Research Methodology
Course Code	BSMB 702 (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have some basic knowledge of statistics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Steps in scientific research methodology	Case Study	BL2-Understand	2
2	Sampling process	Case Study	BL2-Understand	2
3	Developing Hypothesis	Case Study	BL2-Understand	2
4	Data collection	Case Study	BL3-Apply	2
5	Analysis of Variance	Case Study	BL3-Apply	2
6	Randomized Block Design	Case Study	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Research methodology, C. R. Kothari, 6th Edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5037945/
References Books	Research methodology, Panneerselvam, R., Prentice Hall of India, New Delhi
MOOC Courses	https://nptel.ac.in/courses/121106007
Videos	https://nptel.ac.in/courses/121106007

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	-	-	-	-	1	2	-	-	-	-	-
CO2	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO3	1	2	-	-	-	-	-	-	1	2	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	1	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Microbial Quality Control in Food and Pharmaceutical Industries
Course Code	BSMB 801 (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must be aware with the basic laboratory rules and regulations, safety measures and bioethics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Design of a quality control Laboratory	PBL	BL3-Apply	3
II	SOP designing and hands on Practice	PBL	BL3-Apply	7
III	Bioburden test, sterility test, environmental monitoring, detection of specific pathogens, personal hygiene Monitoring	PBL	BL4-Analyze	15 days
IV	To learn Good Laboratory Practice (GLP), Major drug and food regulatory agencies	Industrial Visit	BL2-Understand	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Harrigan WF (1998)Laboratory Methods in Food Microbiology, 3rd ed. Academic Press. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3624724/#:~:text=Quality%20control%20(QC)%20in%20diagnostic,identification%20and%20antibacterial%20susceptibility%20testing.
References Books	Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
MOOC Courses	https://nptel.ac.in/courses/112107259
Videos	https://nptel.ac.in/courses/112107259

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	2	2	-	-	-	-	-	1	2	2
CO2	1	2	3	2	2	1	-	-	-	-	-	-	2	2	1
CO3	1	1	1	1	2	1	1	-	-	-	-	-	-	-	1
CO4	2	-	1	1	1	1	-	-	-	-	-	-	1	1	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Hindi I
Course Code	BSMB AECII (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Foundation core							
Pre-Requisite/s	हिंदी भाषा का मूल गया ज्ञान होना आवश्यक है			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✓ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG3(Good health and well-being) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	हिंदी भाषा और नैतिक मूल्य : मध्य प्रदेश शासन
Articles	https://www.cvs.edu.in/upload/IMG-20200323-WA0003.pdf
References Books	
MOOC Courses	https://onlinecourses.swayam2.ac.in/cec20_lg05/preview
Videos	https://onlinecourses.swayam2.ac.in/cec20_lg05/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	-
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	2	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	English II
Course Code	BSMB AECIII (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	**Co-Requisite/s**	1.Communication Skills Workshop 2.Emotional Intelligence Training 3.Conflict Resolution Seminar 4.Leadership Development Program 5.Cross-Cultural Competency Training 6.CareerDevelopment Workshops						
Course Outcomes & Bloom's Level	**CO1-** To identify the basic concepts and view of professional and scientific communication approaches for microbiology settings **(BL1-Remember)** **CO2-** To understand the gene transfer mechanisms and a detailed insight into mutations and their analysis **(BL2-Understand)** **CO3-** To describe comprehensive understanding of sterilization processes and media preparation pipelines **(BL3-Apply)** **CO4-** To provide experimental basis, and to enable students to analyse the basic concepts of microbial evolution, phylogeny, nutritional aspects, and elements of microbial genetics**(BL4-Analyze)** **CO5-** To apply Appraise the current regulatory, quality control, and legal frameworksthat impact biotechnology and ethical behaviours that foster positive and productive interactions in diverse microbiology and biotechnology settings.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Fluency in English - Part II, 2006, Oxford University Press. • Business English, 2008, Pearson Publication.
Articles	https://www.frontiersin.org/articles/10.3389/feduc.2019.00087/full https://www.cii.co.uk/media/6158020/a-useful-guide-to-swot-analysis.pdf http://www.mmmut.ac.in/News_content/35141tpnews_10142020.pdf
References Books	• Language, Literature and Creativity, 2013, Orient Blackswan. • John E Warriner, Harcourt, Brace, Jovanovich, Warriner's English Grammar and Composition: Complete Course, 1973.
MOOC Courses	https://www.edx.org/learn/leadership/catalyst-leading-with-effective-communication-inclusive-leadership-training?hs_analytics_source=referrals&utm_source=mooc.org&utm_medium=referral&utm_campaign=mooc.org-course-list https://www.edx.org/learn/writing/university-of-california-berkeley-academic-and-business-writing?hs_analytics_source=referrals&utm_source=mooc.org&utm_medium=referral&utm_campaign=mooc.org-course-list
Videos	https://www.youtube.com/watch?v=fq98P9N9Hbg https://www.youtube.com/watch?v=uA5YeqgsjmYhttps://www.youtube.com/watch?v=eBSeCp__xhI

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	1	2	3	-	-	3	2	-	2	3	2	2	-
CO2	-	2	2	3	-	2	-	2	3	-	-	-	-	-	-
CO3	2	-	3	-	2	2	2	3	2	-	-	-	-	2	1
CO4	2	-	3	-	2	-	3	-	2	-	3	2	-	2	3
CO5	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Plant Physiology
Course Code	BSMB GE IV (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
Articles
References Books
MOOC Courses
Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Animal Physiology
Course Code	BSMB GEIV (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
Articles
References Books
MOOC Courses
Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	India in 21st Century
Course Code	BSMB VAC II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
Articles
References Books
MOOC Courses
Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Disaster Management
Course Code	BSMB VACIII (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Fundamentals of Biochemistry
Course Code	BSMB101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	General Microbiology
Course Code	BSMB102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Molecular Biology –I
Course Code	BSMB201(T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Molecular Biology-II
Course Code	BSMB301(T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Plant Tissue Culture
Course Code	BSMB302(T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Genetics
Course Code	BSMB303(T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Genetic Engineering, Tools and applications
Course Code	BSMB401(T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Bioprocess Engineering
Course Code	BSMB402(T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Enzymology
Course Code	BSMB403(T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Plant Ecology
Course Code	BSMBGE II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	General anatomy & comparative anatomy of Vertebrates
Course Code	BSMBGE II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Inorganic Chmeistry
Course Code	BSMBGEIII (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Environmental Issues and Sustainable Development
Course Code	BSMBVACIV (T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Mechanics
Course Code	BSPH0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Properties of Matter
Course Code	BSPH0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_PCM

Title of the Course	Properties of Matter
Course Code	BSPH0102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Statistical physics
Course Code	BSPH0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_ComputerScience

Title of the Course	Optics
Course Code	BSPH0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Optics
Course Code	BSPH0301[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Oscillations of Waves
Course Code	BSPH0302[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Electricity and Magnetism
Course Code	BSPH0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_ComputerScience

Title of the Course	Electricity and Magnetism
Course Code	BSPH0401[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Electromgnetic Theory
Course Code	BSPH0404[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_PCM

Title of the Course	Elementry quantum mechanics
Course Code	BSPH0502[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

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Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	Java Programing
Course Code	BSPH0502[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
Articles
References Books
MOOC Courses
Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_PCM

Title of the Course	Classical Mechanics
Course Code	BSPH0601[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Enzyme Technology
Course Code	BT 202 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Immunotechnology
Course Code	BT 204 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Open Elective 1 : Bioinformatics
Course Code	BT 205 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Genetic Engineering
Course Code	BT 301 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Plant Biotechnology
Course Code	BT 302(T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Animal Biotechnology
Course Code	BT 303 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Agriculture Biotechnology and IPR
Course Code	BT 305 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Biophysics and Biochemistry
Course Code	BT-101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	General Microbiology and Microbial Genetics
Course Code	BT-102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Cell Biology
Course Code	BT-103[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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MSc_Biotechnology

Title of the Course	Bioanalytical Techniques
Course Code	BT-104[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Stem cell biology
Course Code	BT-205 (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Bioprocess Engineering
Course Code	BT304 (T)

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Research Project
Course Code	BT401

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Environemntal Microbiology
Course Code	DSE I (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Environmental Biotechnology
Course Code	DSE I (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Environemntal Microbiology
Course Code	DSE I (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Environmental Biotechnology
Course Code	DSE I (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Processing of fish and Marine Products [T]
Course Code	DSE I- BSFT-0504b

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Agricutlure Microbiology
Course Code	DSE II (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Agricutlure Microbiology
Course Code	DSE II (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Bsc_Microbiology

Title of the Course	Agriculture Biotechnology and Intellectual property rights
Course Code	DSE II (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Agriculture Biotechnology and Intellectual property rights
Course Code	DSE II (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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BSc_FoodTechnology

Title of the Course	Flavor Technology [T]
Course Code	DSE II- BSFT-0604a

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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BSc_FoodTechnology

Title of the Course	Vegetable & dairy fat rich product [T]
Course Code	DSE II- BSFT-0604b

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Organic Mechanisms in Biology
Course Code	DSE III (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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BSc_Biotechnology

Title of the Course	Waste Management
Course Code	DSE III (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Bsc_Microbiology

Title of the Course	Organic Mechanisms in Biology
Course Code	DSE III (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Molecular Diagnostics
Course Code	DSE IV (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Molecular Diagnostics
Course Code	DSE IV (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Frontiers in Biotechnology & Microbiology
Course Code	DSE IV (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_Biotechnology

Title of the Course	Medical Biotechnology
Course Code	DSE V (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Medical Microbiology
Course Code	DSE V (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Bsc_Microbiology

Title of the Course	Medical Biotechnology
Course Code	DSE V (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

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Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Bsc_Microbiology

Title of the Course	Medical Microbiology
Course Code	DSE V (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

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Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Bsc_Microbiology

Title of the Course	Industrial Biotechnology
Course Code	DSE VI (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Bsc_Microbiology

Title of the Course	Industrial Microbiology
Course Code	DSE VI (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Industrial Microbiology
Course Code	DSE VI (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

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Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Industrial Biotechnology
Course Code	DSE VI (T)

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Pharmaceutical Biotechnology
Course Code	DSE VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Bsc_Microbiology

Title of the Course	Pharmaceutical Biotechnology
Course Code	DSE VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Food and Dairy Microbiology
Course Code	DSE VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Bsc_Microbiology

Title of the Course	Food and Dairy Microbiology
Course Code	DSE VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_ComputerScience

Title of the Course	Cloud Computing
Course Code	DSE0601[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_ComputerScience

Title of the Course	Mobile Application Development
Course Code	DSE0603[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_PCM

Title of the Course	Electronics
Course Code	DSE1[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_ComputerScience

Title of the Course	AI and its Application
Course Code	DSE1[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

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Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_PCM

Title of the Course	Condence Matter Physics
Course Code	DSPH0601[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_PCM

Title of the Course	Atomic and Molecular Physics
Course Code	DSPH0602[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Field Project/Internship
Course Code	FP/In I

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Field Project/Internship
Course Code	FP/In I

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Field Project/Internship
Course Code	FP/In II

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Field Project/Internship
Course Code	FP/In II

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

MSc_FoodTechnology

Title of the Course	Principles of Food Processing [T]
Course Code	FT-101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

MSc_FoodTechnology

Title of the Course	Fundamentals of Food Chemistry [T]
Course Code	FT-102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Food Additives [T]
Course Code	FT-103[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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MSc_FoodTechnology

Title of the Course	Food Microbiology [T]
Course Code	FT-104[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Sensory Evaluation and Food Waste Management [T]
Course Code	FT-105[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Processing of Cereals, Pulses, Oilseeds and Sugar Crops [T]
Course Code	FT-202 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

MSc_FoodTechnology

Title of the Course	Processing of Milk and Milk Products [T]
Course Code	FT-203 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

MSc_FoodTechnology

Title of the Course	Livestock products Technology [T]
Course Code	FT-204 [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Beverage Technology [T]
Course Code	FT-301 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Food analysis and Instrumentation [T]
Course Code	FT-302 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Food Packaging [T]
Course Code	FT-304 [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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MSc_FoodTechnology

Title of the Course	Research Project [P]
Course Code	FT-401 [P]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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MSc_FoodTechnology

Title of the Course	Research Report and Presentation [P]
Course Code	FT-402 [P]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_FoodTechnology

Title of the Course	Tools and techniques for food [T]
Course Code	GE-II [T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_FoodTechnology

Title of the Course	Food and Business Management
Course Code	GE-III

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_FoodTechnology

Title of the Course	Entrepreneurship Development [T]
Course Code	GE-IV [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

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Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Intellectual Property Rights [T]
Course Code	GE-IV [T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_Biotechnology

Title of the Course	Animal Diversity
Course Code	GEI[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

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Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Industrial training
Course Code	IAPC I

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Industrial training
Course Code	IAPC II

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	IAPC III [P]
Course Code	IAPC III [P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	IAPC IV [P]
Course Code	IAPC IV [P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	NCC-2
Course Code	NCC-2

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	NCC-I
Course Code	NCC-I

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_PCM

Title of the Course	NCC
Course Code	NCC0101

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	NCC
Course Code	NCC0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Syllabus-2023-2024

BSc_PCM

Title of the Course	NCC (optional)
Course Code	NCC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	NCC (optional)
Course Code	NCC0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Bioinstrumentation
Course Code	SEC I [T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Cooperation Marketing & Finance
Course Code	SEC V

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Organic Farming
Course Code	SEC V (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Marine Microbiology
Course Code	SEC V (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Organic Farming
Course Code	SEC V (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Marine Microbiology
Course Code	SEC V (T)

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Food Supply chain Management [T]
Course Code	SEC V [T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_FoodTechnology

Title of the Course	Introduction to CAD and CAM
Course Code	SEC VI

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

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Bsc_Microbiology

Title of the Course	Introduction to Good Laboratory practices
Course Code	SEC VI (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Introduction to Good Laboratory practices
Course Code	SEC VI (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Entrepreneurship development
Course Code	SEC VI (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Entrepreneurship development
Course Code	SEC VI (T)

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Human Health and Vaccinology
Course Code	SEC VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

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BSc_Biotechnology

Title of the Course	Hydroponics Cultivation
Course Code	SEC VII (T)

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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BSc_FoodTechnology

Title of the Course	Introduction to food analysis [P]
Course Code	SEC-IV [P]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
Articles
References Books
MOOC Courses
Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Bioinstrumentation
Course Code	SECI[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	India in 21st Century
Course Code	VAC II (T)

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Human Nutrition [T]
Course Code	VAC-III [T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books
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Videos

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Environmental Science
Course Code	VACI[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
Course Type								
Course Category								
Pre-Requisite/s	**Co-Requisite/s**							
Course Outcomes & Bloom's Level								
Coures Elements		**SDG (Goals)**						

Part B

Modules	**Contents**	**Pedagogy**	**Hours**

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

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Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3