



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)

Madagadipet, Puducherry - 605 107



SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOSCIENCES

B.Sc. BIOTECHNOLOGY

Minutes of Board of Studies Second Meeting

Venue

Hall No.203, School of Arts and Science Block

Date and Time

26.2.2022 from 10.30 am to 2.00 pm



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SCHOOL OF ARTS AND SCIENCE BOARD OF STUDIES ON B.Sc. BIOTECHNOLOGY

Minutes of Board of Studies Second Meeting

The Board of Studies second meeting of the Department of Bioscience for B.Sc. Biotechnology Programme was held on 26.2.2022 from 10.30 am to 2.00 pm through offline mode at the Meeting Hall, Administrative Building, School of Arts and Science, Sri Manakula Vinayagar Engineering College (Autonomous), Puducherry.

The following members were present for the BoS meeting

S.No	Name of the Member with Designation and official Address	Members as per UGC norms
1	Dr. T.R.Rajaram, HOD, Department of Bioscience-Biotechnology, School of Arts and Science Sri Manakula Vinayagar Engineering College (Autonomous) Madagadipet, Pondicherry	Chairman
2	Dr. V. Arul Professor, Department of Biotechnology Pondicherry University, Pondicherry.	Subject Expert (University Nominee)
3	Dr. Medha Rajappa Professor, Department of Biochemistry JIPMER, Pondicherry	Subject Expert (Academic Council Nominee)
4	Dr. D. Panneer Scientist C, Microbiology and Molecular Biology, Vector Control Research Centre, Pondicherry	Subject Expert (Academic Council Nominee)
5	Dr. A. Balamurugan Group Leader-Microbiology Lab-Quality Control Solara Active Pharma Sciences Ltd, Cuddalore	Representative from Industry
6	Ms.A.Yuvarani, Assistant Professor Department of Biosciences-Biotechnology School of Arts and Science SMVEC, Madagadipet, Pondicherry	Internal Member
6	Dr. S.Deepa, HOD, Department of Chemistry, School of Arts and Science, SMVEC, Madagadipet, Pondicherry	Internal Member
7	Mr. Krishnamurthy, Assistant Professor, Department of Mathematics, School of Arts and science, SMVEC, Madagadipet, Pondicherry	Internal Member

AGENDA OF THE MEETING

Item No.: BoS/2022/SAS/UG/BT 2.1

Welcome address to the BoS Members.

Item No.: BoS/2022/SAS/UG/BT 2.2

To discuss about the first and second semester execution, lab establishment and department activities.

Item No.: BoS/2022/SAS/UG/BT 2.3

To discuss and approve the Curriculum and Syllabi for III and IV semester under Autonomous Regulations 2020 for the B.Sc. Biotechnology.

- Course structure
- Core course
- Discipline Specific Elective
- Open elective offered to other departments
- Skill Enhancement Courses
- Employability Enhancement Courses
- UGC - Mandatory Courses
- Credit requirement

Item No.: BoS/2022/SAS/UG/BT 2.4

To discuss about the general strengthening and supporting for the department.

Minutes of Meeting

The meeting deliberated on the agenda items that have been approved by the Chairman.

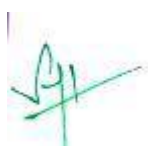
<p>Item No.: BoS/2022/SAS/UG/BT 2.1</p>	<p>Welcome address to the BoS Members</p> <ul style="list-style-type: none"> Chairman of BoS gave the welcome address to the BoS members.
<p>Item.: BoS/2022/SAS/UG/BT No2.2</p>	<p>To discuss about the first and second semester execution, lab establishment and department activities.</p> <ul style="list-style-type: none"> The Board discussed about the understanging level of theory and individual students exposure into the practicals and department activities done in the last semester. The Panel appreciated.
<p>Item No.: BoS/2022/SAS/UG/BT2. 3</p>	<p>To discuss and approve the Curriculum and Syllabi for III and IV semester under Autonomous Regulations 2020 for the B.Sc. Biotechnology. (Annexure -II)</p> <ul style="list-style-type: none"> The chemistry BOS members and Board chairman have suggested to do modification in chemistry II theory and practical and the same was accepted by Biotechnology BoS members (Refer Annexure - I). The BoS members have recomended to Replace the 4th semester Skill enhancement course Research & Development to Research Methodology. (Refer Annexure - I) The BoS members have recomended to Replace the 6th semester core course Research Methodology to Genomice and Proteomics. The BoS members have recomended to merge the 6th semester Skill enhancement course Bioenterepreneurship with Research & Development as Research & Development and Bioenterepreneurship. The BoS members have recomended to offer new Open elective cources to other department students in the 3^{ed} and 4th semester.
<p>Item No.: BoS/2022/SAS/UG/BT 2.4</p>	<p>To disuuss about the general strenthening and supporting for the department.</p> <ul style="list-style-type: none"> The BoS members have recomended to subscribe Biotechnology Journals. The panel appreciated about the availability of equipments in Biotechnology laboratory. The BoS members have recomended to reduce the weekly hours to the class. The BoS members have recomended to add new Teaching faculty in the next Academic Year.

The meeting concluded at 2.00 pm with vote of thanks.




Annexure - I

Sl.No.	Regulation	Semester	Course Title with Course Code	Changes	Particulars
1	R 2020	II	Chemistry II- A20CHD203	Complete Syllabus and code	<ul style="list-style-type: none"> The heaviest syllabus was simplified by Chemistry BOS members for the student welfare and the same was approved in Biotechnology BoS (Annexure -II)
2	R 2020	IV	Research methodology- A20BTS404	Complete Course	<ul style="list-style-type: none"> The course title was changed from Research & Development into Research Methodology. (Annexure -III)
3	R 2020	IV	Genomics and Proteomics- A20BTT621	Complete Course	<ul style="list-style-type: none"> Replace the 6th semester core course Research Methodology into Genomics and Proteomics. (Annexure - III)
4	R 2020	VI	R & D and Bioentereprene- urship- A20BTS606	Merge the Courses	<ul style="list-style-type: none"> 6th semester Skill enhancement course Bioenterepreneurship merge with R & D and Bioenterepreneurship(Annexure - III)
5	R 2020	III & IV	Offering Open elective courses	Title chenges in open elective courses	<ul style="list-style-type: none"> new Open elective courses to other department students. (Annexure - III)




(Annexure -II)

A20CHD203	CHEMISTRY- II	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamentals of Organic Chemistry
- To understand stereochemistry of organic molecules
- To gain knowledge about Electrochemistry
- To understand the chemical analysis
- To study about Bioinorganic Chemical analysis

Course Outcomes

After completion of this course, the students will be able to

CO1-Develop the basicknowledge about Organic Chemistry

CO2- Understand stereochemistry of organic molecules

CO3 -Understand electrochemistry

CO4- Understand about chemical analysis

CO5-Understand the Bioinorganic Chemical analysis

UNIT I FUNDAMENTALS OF ORGANIC CHEMISTRY

(12 Hrs)

Classification of organic compounds - Nomenclature, tetravalency of carbon,- Classification of reagents - electrophiles, nucleophiles and free radicals - Classification of reactions - addition, substitution, elimination, condensation and polymerisation **Polar Effects**-Inductive effect, resonance, hyper-conjugation, steric effect - Keto-enol tautomerism - electrophilic substitution mechanism in benzene (Nitration and Sulphonation)

UNIT II STEREOCHEMISTRY

(12 Hrs)

Classifications -Types of isomerism -structural isomerism - chain, position, functional,metamerism - tautomerism - stereo isomerism - Geometrical and optical isomerism.Enantiomerism, Diastereomerism and Meso compounds. D and L configuration; cis - trans nomenclature,R/ S (for only one chiral carbon atoms) and E / Z Nomenclature (for ethene).Chirality of organic compounds with special reference to amino acids and sugar

UNIT III ELECTROCHEMISTRY

(12 Hrs)

Electrochemistry-I: Strong and weak electrolytes, common ion effect, pH, buffer solutions,Henderson equation and buffer action in biological systems. **Electrochemistry-II:** Galvanic cells: EMF, standard electrode potentials, reference electrodes (NHE and Calomel).

UNIT IV CHEMICAL ANALYSIS

(12Hrs)

Gravimetric analysis - Introduction- Gravimetric analysis by precipitation, Optimum conditions for good precipitation, Physical nature of precipitate, Purity of precipitate: co-precipitation, post-precipitation, Organic precipitants and their applications. Volumetric analysis - principles of Volumetric analysis, Acid - base titration, redox and metal ion indicators.

UNIT V BIO INORGANIC CHEMISTRY

(12 Hrs)

Essential & Trace element in Biological process, Metalloporphyrins and with special reference to Haemoglobin and Myoglobin, Biological role of alkali and alkali earth metals with special reference to Ca²⁺

Text Books:

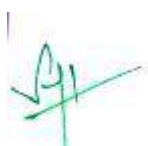
1. Bhupinder Mehta, Manju Mehta, "Organic Chemistry", Prentice Hall of India Pvt Ltd. New Delhi. 1st Edition, 2015.
2. B.S. Bahl and Arun Bahl, "Advanced Organic Chemistry", S. Chand and Company Ltd, New Delhi. 1st Edition, 1998.
3. B.B.L Srinivasata, Amarnath Mishra, "Fundamental of Analytical Chemistry", IP Innovative Publication Pvt. Ltd., 1st Edition, 2016.

Reference Books:

1. I.L. Finar, "Organic chemistry Vol 1", Pearson Edition, Singapore, 6th Edition, 2005.
2. R.T. Morrison and R.N. Boyd, "Organic chemistry", Prentice Hall Private Limited, New Delhi, 6th Edition, 1997.
3. P.L. Soni, "Text Book of Organic Chemistry", Sultan Chand, New Delhi, 1st Edition, 2005.

Web references:

1. <https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/nomen1.htm>
2. <https://www.toppr.com/guides/chemistry/organic-chemistry/isomerism/>
3. <https://www.chemguide.co.uk/organicprops/alkanes/background.html>



A20CHL224	CHEMISTRY- II PRACTICALS	L	T	P	C	Hrs
		0	0	2	2	30

Course objective

- To learn the Qualitative analysis of organic samples, Separation of organic compounds, Hardness of water.

Course Outcomes

After the completion of this course, the students will be able to

- To perform the Qualitative analysis of organic samples, Separation of organic compounds, Hardness of water.

1. Qualitative analysis of Alcohol
2. Qualitative analysis of Aldehydes
3. Qualitative analysis of Nitro Compounds
4. Qualitative analysis of Carboxylic acid (mono)
5. Qualitative analysis of Carbohydrates
6. Determination of Hardness of water.
7. Determination of acetic acid in commercial vinegar using NaOH
8. Determination of alkali content - antacid tablet using HCl

Text Books:

1. Rageeb Md. Usman, Dr. Sunila T, "Practical Hand Book of Systematic Organic Qualitative Analysis", Unicorn Publication Pvt. Ltd, 1st Edition, 2015.
2. Israel Arthur Vogel, "Vogel's Textbook of Practical Organic Chemistry", Wiley Edition: 1st Edition, 1989.
3. Arthur Israel Vogel, "Elementary Practical Organic Chemistry" Prentice Hall Press; 3rd Edition, 1980.

Reference Books:

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., "Basic Principles of Practical Chemistry", New Delhi, Sultan Chand and Sons. 2nd Edition, 1997.
2. Mendham. J, Denney. R.C, Bames. J.D, and Thomas, M. "Vogel's Text book of Quantitative Analysis", Pearson Education, 1st Edition, 1989.
3. Gopalan.R, Subramaniam.P.S and Rengarajan.K, "Elements of Analytical Chemistry", Sultan Chand and Sons, 1st Edition, 2004.

Web references:

1. https://assets.cambridge.org/97805212/91125/frontmatter/9780521291125_frontmatter.pdf
2. https://www.csub.edu/chemistry/organic/manual/Lab14_QualitativeAnalysis.pdf
3. <http://rushim.ru/books/praktikum/Mann.pdf>

(Annexure -III)

SEMESTER-I										
S.No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT101 A20FRT101	Tamil-I/French-I	MIL	3	0	0	3	25	75	100
2	A20GET101	General English -I	ENG	3	0	0	3	25	75	100
3	A20BTT101	Cell biology	DSC	4	0	0	4	25	75	100
4	A20BTT102	Biochemistry - I - Biomolecules	DSC	4	0	0	4	25	75	100
5	A20BTD101	Chemistry - I	IDC	3	1	0	4	25	75	100
Ability Enhancement Compulsory Course										
6	A20AET101	Environmental Studies	AECC	2	0	0	2	100	0	100
Practical										
7	A20BTL103	Cell biology and Biomolecules Practical	DSC	0	0	4	2	50	50	100
8	A20BTD102	Chemistry - I Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20BTS101	Communication Skills Lab	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
10	A20BTC101	Certification course -I	EEC	2	0	2	0	100	0	100
							26	525	475	1000
SEMESTER- II										
S. No.	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT202 A20FRT202	Tamil-II/French-II	MIL	3	0	0	3	25	75	100
2	A20GET202	General English-II	ENG	3	0	0	3	25	75	100
3	A20BTT204	Fundamentals of Microbiology	DSC	4	0	0	4	25	75	100
4	A20BTT205	Biochemistry-II- Intermediary Metabolism	DSC	4	0	0	4	25	75	100
5	A20CHD203	Chemistry -II	IDC	3	1	0	4	25	75	100
Ability Enhancement Compulsory Course										
6	A20AET202	Public Administration	AECC	2	0	0	2	100	0	100
Practical										
7	A20BTL206	Fundamentals of Microbiology and Intermediary Metabolism Practical	DSC	0	0	4	2	50	50	100
8	A20CHL224	Chemistry-II Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20BTS202	Medical Laboratory Technology	SEC	0	0	4	2	100	0	100
Extension Activities										
10	A20EAL201	National Service Scheme	EA	0	0	2	1	100	0	100
Employment Enhancement Course										
11	A20BTC202	Certification course- II	EEC	2	0	2	0	100	0	100
							27	625	475	1100

SEMESTER - III										
S. No	Course Code	Course Title	category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT307	Molecular Biology	DSC	4	0	0	4	25	75	100
2	A20BTT308	Analytical Techniques in Biotechnology	DSC	4	0	0	4	25	75	100
3	A20BTD304	Applied Microbiology	IDC	3	1	0	4	25	75	100
4	A20BTE3XX	DSE-I	DSE	3	0	0	3	25	75	100
5	A20XXO3XX	Open Elective-I	OE	2	0	0	2	25	75	100
Practical										
6	A20BTL309	Molecular Biology and Analytical Techniques in Biotechnology Practical	DSC	0	0	4	2	50	50	100
7	A20BTL323	Applied Microbiology Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20BTS303	Soft Skills Lab	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20BTC303	Certification course- III	EEC	2	0	2	0	100	0	100
							23	425	475	900

SEMESTER- IV										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT410	Genetic Engineering	DSC	4	0	0	4	25	75	100
2	A20BTT411	Immunology	DSC	4	0	0	4	25	75	100
3	A20MAD409	Biostatistics	IDC	3	1	0	4	25	75	100
4	A20BTE4XX	DSE-II	DSE	3	0	0	3	25	75	100
5	A20XXO4XX	Open Elective- II	OE	2	0	0	2	25	75	100
Practical										
6	A20BTL412	Genetic Engineering and Immunology Practical	DSC	0	0	4	2	50	50	100
7	A20MAL404	Biostatistics Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20BTS404	Research Methodology	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20BTC404	Certification course- IV	EEC	2	0	2	0	100	0	100
							23	425	475	900

SEMESTER-V										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT513	Animal Biotechnology	DSC	3	1	0	4	25	75	100
2	A20BTT514	Bioinformatics	DSC	3	1	0	4	25	75	100
3	A20BTT515	Medical Biotechnology	DSC	3	1	0	4	25	75	100
4	A20BTE5XX	DSE-III	DSE	3	0	0	3	25	75	100
Practical										
5	A20BTL516	Animal Biotechnology and Bioinformatics Practical	DSC	0	0	4	2	50	50	100
6	A20BTL517	Medical Biotechnology and DSE- III Practical	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
7	A20BTS505	In-Plant training / Internship	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
8	A20BTC505	Certification course- V	EEC	2	0	2	0	100	0	100
							21	400	400	800

SEMESTER-VI										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT618	Plant Biotechnology	DSC	3	1	0	4	25	75	100
2	A20BTT619	Microbial Biotechnology	DSC	3	1	0	4	25	75	100
3	A20BTT620	Biosafety, Bio-ethics and IPRs	DSC	3	1	0	4	25	75	100
4	A20BTT621	Genomics and Proteomics	DSC	3	1	0	4	25	75	100
5	A20BTE6XX	DSE- IV	DSE	3	0	0	3	25	75	100
Practical										
5	A20BTL622	Plant Biotechnology and Microbial Biotechnology Practical	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
6	A20BTS606	R & D and Bio entrepreneurship	SEC	4	0	0	2	100	0	100
Employment Enhancement Course										
7	A20BTC606	Certification course-VI	EEC	2	0	2	0	100	0	100
							23	375	425	800

DISCIPLINE SPECIFIC ELECTIVE COURSES

DISCIPLINESPECIFIC ELECTIVES										
S. No.	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Discipline Specific Electives (DSE - I) - offered in Third Semester										
1	A20BTE301	Genetics	DSE	3	0	0	3	25	75	100
2	A20BTE302	General Biology	DSE	3	0	0	3	25	75	100
3	A20BTE303	Parasitology and Entomology	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - II) - offered in Fourth Semester										
1	A20BTE404	Developmental Biology	DSE	3	0	0	3	25	75	100
2	A20BTE405	Biology of Cloning Vectors	DSE	3	0	0	3	25	75	100
3	A20BTE406	Molecular Diagnosis	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - III) - offered in Fifth Semester										
1	A20BTE507	r-DNA Technology	DSE	3	0	0	3	25	75	100
2	A20BTE508	Environmental Biotechnology	DSE	3	0	0	3	25	75	100
3	A20BTE509	Bioprocess Technology	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - IV) - offered in Sixth Semester										
1	A20BTE610	Enzyme Technology	DSE	3	0	0	3	25	75	100
2	A20BTE611	Marine Biotechnology	DSE	3	0	0	3	25	75	100
3	A20BTE612	Pharmaceutical Biotechnology	DSE	3	0	0	3	25	75	100

OPEN ELECTIVE COURSES

Open Elective - I (Offered in Semester III)				
Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO301	Biotechnology for human welfare	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
2	A20BTO302	Food Processing	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
3	A20BTO303	Food Technology	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
4	A20CHO304	Food Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
5	A20CHO305	Molecules of Life (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
6	A20CHO306	Water Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
7	A20CMO307	Fundamentals of Accounting and Finance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
8	A20CMO308	Fundamentals of Management	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
9	A20CMO309	Fundamentals of Marketing	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
10	A20CPO310	Data Structures	Computational Studies	Mathematics
11	A20CPO311	Programming in C	Computational Studies	Commerce and Management, Mathematics, Media Studies
12	A20CPO312	Programming in Python	Computational Studies	Commerce and Management, Mathematics, Media Studies
13	A20ENO313	Conversational Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
14	A20ENO314	Fine-tune your English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics

Academic Curriculum and Syllabi R-2020

15	A20ENO315	Interpersonal Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO316	Mathematical Modelling	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
17	A20MAO317	Quantitative Aptitude - I	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO318	Statistical Methods	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO319	Event Management	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO320	Graphic Design	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
21	A20VCO321	Role of social media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
22	A20NDO322	Basic Food Groups	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO323	Life Style Management	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
24	A20NDO324	Nutritive Value of Foods	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO325	Astrophysics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
26	A20PHO326	Basic of Modern Communication System	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
27	A20PHO327	Bio-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies

Academic Curriculum and Syllabi R-2020

28	A20TMO328	அடிப்படைத் தமிழ்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO329	வாழ்வியல் இலக்கணம்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
30	A20TMO330	புதுக்கவிதைப் பட்டறை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics

Open Elective - II (Offered in Semester IV)				
Sl. No.	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO401	Herbal Technology	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
2	A20BTO402	Vermiculture	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
3	A20BTO403	Biotechnology for Society	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
4	A20CHO404	C++ Programming and its Application to Chemistry	Chemistry	Computational Studies, Mathematics, Physics
5	A20CHO405	Computational Chemistry Practical	Chemistry	Computational Studies, Mathematics, Physics
6	A20CHO406	Instrumental Methods of Analysis	Chemistry	Computational Studies, Mathematics, Physics
7	A20CMO407	Essential Legal Awareness	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
8	A20CMO408	Essentials of Insurance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
9	A20CMO409	Practical Banking	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics


Bachelor of Science in Biotechnology

Academic Curriculum and Syllabi R-2020



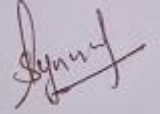
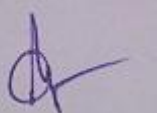
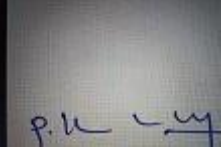
10	A20CPO410	Database Management Systems	Computational Studies	Commerce and Management, Media Studies, Mathematics
11	A20CPO411	Introduction to Data Science using Python	Computational Studies	Chemistry, Commerce and Management, English, Media Studies, Mathematics, Physics
12	A20CPO412	Web Development	Computational Studies	Commerce and Management, Media Studies, Mathematics
13	A20ENO413	English for Competitive Exam	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
14	A20ENO414	English Next-India	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
15	A20ENO415	Functional English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO416	Discrete mathematics	Mathematics	Chemistry, Computational Studies, Physics
17	A20MAO417	Operations Research	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO418	Quantitative Aptitude - II	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO419	Basics of News Reporting	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO420	Scripting for media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
21	A20VCO421	Video Editing	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
22	A20NDO422	Food Labelling	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO423	Hygiene and Sanitation	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil

Academic Curriculum and Syllabi R-2020

24	A20NDO424	Nutrition for Adolescent	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO425	Digital Electronics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
26	A20PHO426	Geo-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
27	A20PHO427	Space Science	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
28	A20TMO428	சிறுகதைப் பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO429	செய்தி வாசிப்பு பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
30	A20TMO430	நிகழ்த்துக்கலை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics




The Minutes of the Meeting of the Second Board of Studies of the Department of Bioscience- B.Sc. Biotechnology was held on 26-2-2022 is signed by the members who attended the meeting:

S.No	Name of the Member with Designation and official Address	Members as per UGC norms	Signature
1	Dr. T.R.Rajaram, HOD, Department of Bioscience-Biotechnology, School of Arts and Science Sri Manakula Vinayagar Engineering College (Autonomous) Madagadipet, Pondicherry	Chairman	
2	Dr. V. Arul Professor, Department of Biotechnology Pondicherry University, Pondicherry.	Subject Expert (University Nominee)	
3	Dr. Medha Rajappa Professor, Department of Biochemistry JIPMER, Pondicherry	Subject Expert (Academic Council Nominee)	
4	Dr. D. Panneer Scientist C, Microbiology and Molecular Biology, Vector Control Research Centre, Pondicherry	Subject Expert (Academic Council Nominee)	
5	Dr. A. Balamurugan Group Leader–Microbiology Lab-Quality Control Solara Active Pharma Sciences Ltd, Cuddalore	Representative from Industry	
6	Ms.A.Yuvarani, Assistant Professor Department of Biosciences-Biotechnology School of Arts and Science SMVEC, Madagadipet, Pondicherry	Internal Member	
6	Dr. S.Deepa, HOD, Department of Chemistry, School of Arts and Science, SMVEC, Madagadipet, Pondicherry	Internal Member	
7	Mr. Krishnamurthy, Assistant Professor, Department of Mathematics, School of Arts and science, SMVEC, Madagadipet, Pondicherry	Internal Member	



HOD



Dean-SAS






SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)

Madagadipet, Puducherry - 605 107



SCHOOL OF ARTS AND SCIENCE

BACHELOR OF SCIENCE

IN

BIOTECHNOLOGY

ACADEMIC REGULATIONS

2020(R-2020)

CURRICULUM AND SYLLABI

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

M1: Quality Education:

To provide comprehensive academic system that amalgamates the cutting-edge technologies with best practices.

M2: Research and Innovation:

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship:

To inculcate the employability and entrepreneurial skills through value and skill-based training.

M4: Ethical Values:

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT OF BIOSCIENCE

BIOTECHNOLOGY - VISION AND MISSION

Vision

- To give Knowledge of both fundamental and applied aspects of Biotechnology
- To develop hardcore specialization in various diversified areas of biotechnology and its application to Medicine, Agriculture, Environment, Nutraceuticals and functional food etc.
- To encourage students to follow emerging scientific interests and talents.
- To provide students with transferable skills and critical thinking and analytical methods, laboratory techniques, team work and scientific communication, information technology and bioinformatics.
- To provide students with high quality research experience

Mission

M1: Quality Education:

- Updating the course curriculum to cater the needs of Academia and Industry
- To impart quality education for life- long professional growth and opportunity in a wide range of Careers.

M2: Research and Innovation:

- To create awareness towards socio-ethical implications of potentials of Biotechnology
- Emphasis on recent trends in Biotechnology through organization of conferences, symposia, workshops.

M3: Employability and Entrepreneurship:

- To inculcate the employability and entrepreneurial skills through value and skill based training.
- To foster value based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

Bachelor of Science in Biotechnology

STRUCTURE FOR UNDERGRADUATE PROGRAMME

S. No	Course Category	Break down of Credits
1	Language Modern Indian Language (MIL)	6
2	English (ENG)	6
3	Discipline Specific Core Courses(DSC)	74
4	Discipline Specific Elective Courses (DSE)	12
5	Inter-Disciplinary Courses(IDC)	24
6	Skill Enhancement Courses(SEC)	12
7	Employability Enhancement Courses(EEC*)	-
8	Ability Enhancement Compulsory Courses(AECC)	4
9	Open Elective(OE)	4
10	Extension Activity(EA)	1
Total		143

SCHEME OF CREDIT DISTRIBUTION –SUMMARY

S. No	Course Category	Credits per Semester						Total Credits
		I	II	III	IV	V	VI	
1	Language Modern Indian Language (MIL)	3	3	-	-	-	-	6
2	English (ENG)	3	3	-	-	-	-	6
3	Discipline Specific Core Courses(DSC)	10	10	10	10	16	18	74
4	Discipline Specific Elective Courses (DSE)	-	-	3	3	3	3	12
5	Inter-Disciplinary Courses(IDC)	6	6	6	6	-	-	24
6	Skill Enhancement Courses(SEC)	2	2	2	2	2	2	12
7	Employability Enhancement Courses(EEC*)	-	-	-	-	-	-	-
8	Ability Enhancement Compulsory Courses(AECC)	2	2	-	-	-	-	4
9	Open Elective(OE)	-	-	2	2	-	-	4
10	Extension Activity(EA)	-	1	-	-	-	-	1
Total		26	27	23	23	21	23	143

* EEC will not be included for the computation of "Total of Credits " as well as "CGPA"

SEMESTER-I										
S.No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT101 A20FRT101	Tamil-I/French-I	MIL	3	0	0	3	25	75	100
2	A20GET101	General English -I	ENG	3	0	0	3	25	75	100
3	A20BTT101	Cell biology	DSC	4	0	0	4	25	75	100
4	A20BTT102	Biochemistry - I - Biomolecules	DSC	4	0	0	4	25	75	100
5	A20BTD101	Chemistry - I	IDC	3	1	0	4	25	75	100
Ability Enhancement Compulsory Course										
6	A20AET101	Environmental Studies	AECC	2	0	0	2	100	0	100
Practical										
7	A20BTL103	Cell biology and Biomolecules Practical	DSC	0	0	4	2	50	50	100
8	A20BTD102	Chemistry - I Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20BTS101	Communication Skills Lab	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
10	A20BTC101	Certification course -I	EEC	2	0	2	0	100	0	100
							26	525	475	1000
SEMESTER- II										
S. No.	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20TAT202 A20FRT202	Tamil-II/French-II	MIL	3	0	0	3	25	75	100
2	A20GET202	General English-II	ENG	3	0	0	3	25	75	100
3	A20BTT204	Fundamentals of Microbiology	DSC	4	0	0	4	25	75	100
4	A20BTT205	Biochemistry-II- Intermediary Metabolism	DSC	4	0	0	4	25	75	100
5	A20CHD203	Chemistry -II	IDC	3	1	0	4	25	75	100
Ability Enhancement Compulsory Course										
6	A20AET202	Public Administration	AECC	2	0	0	2	100	0	100
Practical										
7	A20BTL206	Fundamentals of Microbiology and Intermediary Metabolism Practical	DSC	0	0	4	2	50	50	100
8	A20CHL224	Chemistry-II Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
9	A20BTS202	Medical Laboratory Technology	SEC	0	0	4	2	100	0	100
Extension Activities										
10	A20EAL201	National Service Scheme	EA	0	0	2	1	100	0	100
Employment Enhancement Course										
11	A20BTC202	Certification course- II	EEC	2	0	2	0	100	0	100
							27	625	475	1100

SEMESTER - III										
S. No	Course Code	Course Title	category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT307	Molecular Biology	DSC	4	0	0	4	25	75	100
2	A20BTT308	Analytical Techniques in Biotechnology	DSC	4	0	0	4	25	75	100
3	A20BTD304	Applied Microbiology	IDC	3	1	0	4	25	75	100
4	A20BTE3XX	DSE-I	DSE	3	0	0	3	25	75	100
5	A20XXO3XX	Open Elective-I	OE	2	0	0	2	25	75	100
Practical										
6	A20BTL309	Molecular Biology and Analytical Techniques in Biotechnology Practical	DSC	0	0	4	2	50	50	100
7	A20BTL323	Applied Microbiology Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20BTS303	Soft Skills Lab	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20BTC303	Certification course- III	EEC	2	0	2	0	100	0	100
							23	425	475	900

SEMESTER- IV										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT410	Genetic Engineering	DSC	4	0	0	4	25	75	100
2	A20BTT411	Immunology	DSC	4	0	0	4	25	75	100
3	A20MAD409	Biostatistics	IDC	3	1	0	4	25	75	100
4	A20BTE4XX	DSE-II	DSE	3	0	0	3	25	75	100
5	A20XXO4XX	Open Elective- II	OE	2	0	0	2	25	75	100
Practical										
6	A20BTL412	Genetic Engineering and Immunology Practical	DSC	0	0	4	2	50	50	100
7	A20MAL404	Biostatistics Practical	IDC	0	0	4	2	50	50	100
Skill Enhancement Course										
8	A20BTS404	Research Methodology	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
9	A20BTC404	Certification course- IV	EEC	2	0	2	0	100	0	100
							23	425	475	900

SEMESTER-V										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT513	Animal Biotechnology	DSC	3	1	0	4	25	75	100
2	A20BTT514	Bioinformatics	DSC	3	1	0	4	25	75	100
3	A20BTT515	Medical Biotechnology	DSC	3	1	0	4	25	75	100
4	A20BTE5XX	DSE-III	DSE	3	0	0	3	25	75	100
Practical										
5	A20BTL516	Animal Biotechnology and Bioinformatics Practical	DSC	0	0	4	2	50	50	100
6	A20BTL517	Medical Biotechnology and DSE- III Practical	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
7	A20BTS505	In-Plant training / Internship	SEC	0	0	4	2	100	0	100
Employment Enhancement Course										
8	A20BTC505	Certification course- V	EEC	2	0	2	0	100	0	100
							21	400	400	800

SEMESTER-VI										
S. No	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	A20BTT618	Plant Biotechnology	DSC	3	1	0	4	25	75	100
2	A20BTT619	Microbial Biotechnology	DSC	3	1	0	4	25	75	100
3	A20BTT620	Biosafety, Bio-ethics and IPRs	DSC	3	1	0	4	25	75	100
4	A20BTT621	Genomics and Proteomics	DSC	3	1	0	4	25	75	100
5	A20BTE6XX	DSE- IV	DSE	3	0	0	3	25	75	100
Practical										
5	A20BTL622	Plant Biotechnology and Microbial Biotechnology Practical	DSC	0	0	4	2	50	50	100
Skill Enhancement Course										
6	A20BTS606	R & D and Bio entrepreneurship	SEC	4	0	0	2	100	0	100
Employment Enhancement Course										
7	A20BTC606	Certification course-VI	EEC	2	0	2	0	100	0	100
							23	375	425	800

**Discipline Specific Electives are to be selected from the list given in Annexure I*

***Open electives are to be selected from the list given in Annexure II*

DISCIPLINE SPECIFIC ELECTIVE COURSES

DISCIPLINESPECIFIC ELECTIVES										
S. No.	Course Code	Course Title	Category	Periods			Credits	Max.Marks		
				L	T	P		CAM	ESM	Total
Discipline Specific Electives (DSE - I) - offered in Third Semester										
1	A20BTE301	Genetics	DSE	3	0	0	3	25	75	100
2	A20BTE302	General Biology	DSE	3	0	0	3	25	75	100
3	A20BTE303	Parasitology and Entomology	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - II) - offered in Fourth Semester										
1	A20BTE404	Developmental Biology	DSE	3	0	0	3	25	75	100
2	A20BTE405	Biology of Cloning Vectors	DSE	3	0	0	3	25	75	100
3	A20BTE406	Molecular Diagnosis	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - III) - offered in Fifth Semester										
1	A20BTE507	r-DNA Technology	DSE	3	0	0	3	25	75	100
2	A20BTE508	Environmental Biotechnology	DSE	3	0	0	3	25	75	100
3	A20BTE509	Bioprocess Technology	DSE	3	0	0	3	25	75	100
Discipline Specific Electives (DSE - IV) - offered in Sixth Semester										
1	A20BTE610	Enzyme Technology	DSE	3	0	0	3	25	75	100
2	A20BTE611	Marine Biotechnology	DSE	3	0	0	3	25	75	100
3	A20BTE612	Pharmaceutical Biotechnology	DSE	3	0	0	3	25	75	100

Annexure -II
OPEN ELECTIVE COURSES

Open Elective - I (Offered in Semester III)				
Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO301	Biotechnology for human welfare	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
2	A20BTO302	Food Processing	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
3	A20BTO303	Food Technology	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
4	A20CHO304	Food Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
5	A20CHO305	Molecules of Life (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
6	A20CHO306	Water Analysis (Practical)	Chemistry	Bioscience, Computational Studies, Food Science, Mathematics, Physics
7	A20CMO307	Fundamentals of Accounting and Finance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
8	A20CMO308	Fundamentals of Management	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
9	A20CMO309	Fundamentals of Marketing	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
10	A20CPO310	Data Structures	Computational Studies	Mathematics
11	A20CPO311	Programming in C	Computational Studies	Commerce and Management, Mathematics, Media Studies
12	A20CPO312	Programming in Python	Computational Studies	Commerce and Management, Mathematics, Media Studies
13	A20ENO313	Conversational Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics

14	A20ENO314	Fine-tune your English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
15	A20ENO315	Interpersonal Skills	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO316	Mathematical Modelling	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
17	A20MAO317	Quantitative Aptitude - I	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO318	Statistical Methods	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO319	Event Management	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO320	Graphic Design	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
21	A20VCO321	Role of social media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
22	A20NDO322	Basic Food Groups	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO323	Life Style Management	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
24	A20NDO324	Nutritive Value of Foods	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO325	Astrophysics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies




26	A20PHO326	Basic of Modern Communication System	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
27	A20PHO327	Bio-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
28	A20TMO328	அடிப்படைத்தமிழ்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO329	வாழ்வியல் இலக்கணம்	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
30	A20TMO330	புதுக்கவிதைப் பட்டறை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics

Open Elective - II (Offered in Semester IV)

Sl. No.	Course Code	Course Title	Offering Department	Permitted Departments
1	A20BTO401	Herbal Technology	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
2	A20BTO402	Vermiculture	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
3	A20BTO403	Biotechnology for Society	Bioscience	Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
4	A20CHO404	C++ Programming and its Application to Chemistry	Chemistry	Computational Studies, Mathematics, Physics
5	A20CHO405	Computational Chemistry Practical	Chemistry	Computational Studies, Mathematics, Physics
6	A20CHO406	Instrumental Methods of Analysis	Chemistry	Computational Studies, Mathematics, Physics
7	A20CMO407	Essential Legal Awareness	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics

8	A20CMO408	Essentials of Insurance	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
9	A20CMO409	Practical Banking	Commerce and Management	Bioscience, Chemistry, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
10	A20CPO410	Database Management Systems	Computational Studies	Commerce and Management, Media Studies, Mathematics
11	A20CPO411	Introduction to Data Science using Python	Computational Studies	Chemistry, Commerce and Management, English, Media Studies, Mathematics, Physics
12	A20CPO412	Web Development	Computational Studies	Commerce and Management, Media Studies, Mathematics
13	A20ENO413	English for Competitive Exam	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
14	A20ENO414	English Next-India	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
15	A20ENO415	Functional English	English	Chemistry, Commerce and Management, Computational Studies, Media Studies, Mathematics, Physics
16	A20MAO416	Discrete mathematics	Mathematics	Chemistry, Computational Studies, Physics
17	A20MAO417	Operations Research	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
18	A20MAO418	Quantitative Aptitude - II	Mathematics	Chemistry, Commerce and Management, Computational Studies, Physics, Biotechnology, Nutrition and Dietetics
19	A20VCO419	Basics of News Reporting	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
20	A20VCO420	Scripting for media	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics
21	A20VCO421	Video Editing	Media Studies	Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Physics




22	A20NDO422	Food Labelling	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
23	A20NDO423	Hygiene and Sanitation	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
24	A20NDO424	Nutrition for Adolescent	Food Science	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Mathematics, Media Studies, Physics, Tamil
25	A20PHO425	Digital Electronics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
26	A20PHO426	Geo-Physics	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
27	A20PHO427	Space Science	Physics	Bioscience, Chemistry, Computational Studies, Mathematics, Media Studies
28	A20TMO428	சிறுகதைப் பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
29	A20TMO429	செய்தி வாசிப்பு பயிற்சி	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics
30	A20TMO430	நிகழ்த்துக்கலை	Tamil	Bioscience, Chemistry, Commerce and Management, Computational Studies, English, Food Science, Mathematics, Media Studies, Physics




A20BTT307	MOLECULAR BIOLOGY	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamentals of Molecular Biology.
- To study the Mechanism of DNA replication.
- To understand the Mechanism of Transcription and Translation.
- To understand the Genetic code.
- To study the Mutation and its types.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Fundamentals of Molecular Biology.

CO2 - Know the basic of Mechanism of DNA replication.

CO3 - Understand the Mechanism of Transcription and Translation.

CO4 - Understand the Genetic code.

CO5 - Understand the Mutation and its types.

UNIT – I

(10 hrs)

Introduction to Molecular Biology, Types of genetic materials- Experiments of Griffith, Avery, MacLeod and McCarty, Hershey and chase, Lederberg and Tatum, Central dogma of life.

UNIT- II

(10 hrs)

Replication of DNA - Models of DNA replication, Mechanism of DNA replication in prokaryotes and eukaryotes (initiation, elongation, replication fork, replication machinery, termination), Enzymes and proteins involved in DNA replication (nucleases, DNA polymerases, DNA helicases, gyrases, SSCP, topoisomerase, primase).

UNIT – III

(15 hrs)

Transcription and Translation - Mechanism of transcription in prokaryotes and eukaryotes, post transcriptional modification, Mechanism of translation in Prokaryotes and Eukaryotes, Post-translational modification of Proteins. Inhibitors of transcription.

UNIT- IV

(15 hrs)

Genetic code - characteristics and properties, Wobble hypothesis. Protein biosynthesis in prokaryotes and eukaryotes, protein degradation, Inhibitors of protein synthesis. Regulation of gene expression (*lac*, *trp* and *gal* operons).

UNIT- V

(10 hrs)

Mutation and its types- spontaneous, induced, reverse, suppressor mutations; chemical mutagens- alkylating agent, nitrous acid, hydroxylamine; physical mutagen- radiation. DNA repair- mismatch repair, excision repair, direct repair and SOS repair.

Text Books:


1. Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
2. P.S. Verma and V.K. Agarwal, 2012, Concepts of Cell Biology. S.Chand & Company Ltd., New Delhi. 2012
3. Dr. David A Thompson. 2011. Cell and Molecular Biology Lab Manual.
4. Lodish. H, Berk. A, Lawrence, A, Matsudaira. A, Baltimore. D and Darnell. J. Molecular Cell Biology (Fourth Edition). Media Connected - W.H.Freeman and Company. 2009
5. Cooper G M & Hausman E, The Cell - A Molecular Approach. (6th edition), Sinauer Associates 2013

Reference Books:

6. Lewin. B , GENES X, (10th edition), Jones & Bartlett Learning, 2011
7. George M. Malacinski. 2013. Freifeder's Essentials of Molecular Biology. Norosa Publishing House.
8. Bruce Alberts, Alexander Johnson. Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter. 2014. Molecular Biology of Cell. Garland Science publication.

Web references:

1. https://www.cs.princeton.edu/courses/archive/spr07/cos424/scribe_notes/0424.pdf
2. <https://microbenotes.com/dna-replication/>
3. <https://atdbio.com/nucleic-acids-book/Transcription-Translation-and-Replication>
4. <https://www.britannica.com/science/genetic-code>
5. <https://www.onlinebiologynotes.com/mutation-and-types-of-mutation/>



	L	T	P	C	Hrs
A20BTT308	4	0	0	4	60

ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY

Course Objectives

- To understand the Principle of microscopy.
- To study the Principle and types of law of spectrophotometry.
- To understand the principle and types of chromatography.
- To understand the principle of electrophoresis .
- To study about Centrifugation.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Principle of microscopy .

CO2 - Know the the Principle and types of law of spectrophotometry

CO3 - Understand the principle and types of chromatography .

CO4 - Understand the principle of electrophoresis and its applications.

CO5- Understand the Centrifugation.

UNIT I

(10 Periods)

Simple microscopy, phase contrast microscopy, florescence and electron microscopy (TEM and SEM), pH meter, absorption and emission spectroscopy.

UNIT II

(10 Periods)

Beer-Lamberts law, Principle and law of absorption fluorimetry, colorimetry, spectrophotometry (visible, UV, infrared)

UNIT III

(15 Periods)

Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity chromatography, ion exchange chromatography, gas chromatography and HPLC.

UNIT IV

(15 Periods)

Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, pulse field gel electrophoresis, immuno- electrophoresis, Western blotting ,isoelectric focusing.

UNIT V

(10 Periods)

Centrifugation - Principle & types, sedimentation co-efficient, sedimentation velocity, ultra centrifugation, separation of macromolecules, subcellular fractionation. ntroduction to Biosensors and Nanotechnology and their applications.

Text Books:

1. Upadhyay., Biophysical Chemistry-, Himalaya Publication, Edition III
2. Ghatak, K.L., 2003. Techniques and Methods In Biology. PHI Learning Private Ltd. New Delhi
3. Zubay.G.L., 1993. Biochemistry, 4thEdi. WmC. Brown Publishers.

Reference Books:

4. Joseph Sambrook and David. W. Russel, Molecular Cloning- A laboratory manual, 4th edition, 2012, Cold spring harbor press.
5. Physical Biochemistry, Applications to Biochemistry and Molecular Biology -D, Freifelder.
6. H.V. Volkones., General Biophysics, Vol I&II
7. Wilson, K. and Walker, J. Practical Biochemistry - Principles and techniques 7th editic 2010, Cambridge University Press,
8. Brawer, I M., Perce, A.M., Experimental techniques in Biochemistry. Prentice Hall Foundation, New York 2012.
9. S.Mahesh., 2003 Biophysics New Age International Private Ltd.

Web references:

1. <https://microbiologynotes.org/microscopy-overview-principles-and-its-types/>
2. <https://microbenotes.com/uv-spectroscopy-principle-instrumentation-applications/>
3. <https://microbenotes.com/chromatography-principle-types-and-applications/>
4. <https://microbiologynotes.org/electrophoresis-overview-principles-and-types/>
5. <https://microbenotes.com/centrifuge-and-centrifugation/>

	APPLIED MICROBIOLOGY	L	T	P	C	Hrs
A20BTD304		4	0	0	4	60

Course Objectives

- To understand about microbes used in Industry
- To study about the industrial Production of organic acids using microbes.
- To understand the industrial Production of antibiotics.
- To understand the role of Microbes in cheese production .
- To study about Production of therapeutic and diagnostic proteins.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand about microbes used in Industry

CO2 - Know about the industrial Production using microbes.

CO3 - Understand the industrial Production of antibiotics.

CO4 - Understand the role of Microbes in cheese production .

CO5- Understand the Production of therapeutic and diagnostic proteins .

UNIT I

(10 Periods)

History and development-Growth phase, Isolation, Preservation Screening of microbes used in Industry: Strain improvement by mutation, selection and enrichment. Bioreactors-types. Air lift, cavitator, acetator, fluid Bed reactors.

UNIT II

(10 Periods)

Production of beverage and industrial alcohols, wine, beer. Production of organic acids -lactic acid, acetone-butanol, citric acid and acetic acid. Production of microbial biomass –SCP.

UNIT III

(15 Periods)

Industrial Production of antibiotics- Penicillin, erythromycin and streptomycin; Bacterial production of enzymes- protease, cellulase, amylase, glucose isomerase, etc, Immobilization of enzymes and development of biosensors.

UNIT IV

(15 Periods)

Role of Microorganisms in cheese production –cheddar cheese, blue cheese, Swiss cheese, camembert cheese, yogurt, buttermilk , sour cream, koumiss, kefir manufacturing. Leather processing.

UNIT V

(10 Periods)

Production of therapeutic and diagnostic proteins –Interferon, somatotropin, cytokines, insulin, growth factors and steroids. Microbial leaching of ores.

Text Books:

1. Gerald (Ed.) Reed. Prescott and Dunn's Industrial Microbiology, Fourth Edition, CBS Publishers and Distributors, 2004.
2. Glick BR and Pasternak JJ. Molecular Biotechnology - Principles & applications of Recombinant DNA. ASM Press, 2009
3. Alani, DI. Murray MY. Perspectives in Biotechnology and applied Microbiology. Elsevier Publication. 1986.
4. Ketchum PA. Applied Microbiology, Microbiology- Concepts and applications. Cassida Jr. Tata McGraw hill Publications, 1994.

References Books:

1. Glick BR and Pasternak JJ. Molecular Biotechnology - Principles & applications of Recombinant DNA. ASM Press, 2006.
2. Staneberry et al. Fermentation Technology, 1998.

Web references:

1. <http://shintarosalia.lecture.ub.ac.id/files/2018/09/ISOLATION-SCREENING-.pdf>
2. <https://www.basu.org.in/wp-content/uploads/2020/06/18th-PPT-of-Foods-and-Industrial-MicrobiologyCourse-No.-DTM-321.pdf>
3. <https://www.biotechnologynotes.com/antibiotics/production/production-of-antibiotics-by-fermentation-bacteria-fungi-and-penicillin/13886>
4. https://microbewiki.kenyon.edu/index.php/Microbial_processes_of_cheese_production
5. <https://medcraveonline.com/JMEN/natural-useful-therapeutic-products-from-microbes.html>



A20BTL309	MOLECULAR BIOLOGY PRACTICALS	L	T	P	C	Hrs
		0	0	2	1	30

Course objective

- To learn the molecular Biology Practicals.

Course Outcomes

After the completion of this course, the students will be able to

- To perform the molecular Biology Practicals.
 1. Chromosomal DNA isolation from Bacteria
 2. Plasmid DNA isolation from Bacteria
 3. RNA isolation from Bacteria
 4. Protein extraction from *E.coli*
 5. SDS - PAGE
 6. Isolation of antibiotic resistant mutant
 7. Agarose gel electrophoresis.
 8. Bacterial mutagenesis by physical method
 9. Bacterial mutagenesis by chemical method

Text Books:

1. Molecular Biology A Practical Manual Paperback – 1 November 2021 by P V G K Sarma
2. Basic Techniques in Biochemistry and Molecular Biology Paperback – 25 June 2020 by R.K. Sharma (Author), S.P.S. Sangha (Author)
3. Advanced Lab Practices in Biochemistry & Molecular Biology Paperback – 1 November 2019 by Suphiya khan Swati Agarwal (Author)

References Books:

1. Essential Molecular Biology: Volume I: A Practical Approach Volume I: Practical Approach Series) Paperback – Illustrated, 5 October 2000 by T A Brown.
2. Analytical Techniques in Biochemistry and Molecular Biology Hardcover – Illustrated, 23 July 2011 by Rajan Katoch , springer.

Web references:

1. [https://s3-us-west-2.amazonaws.com/oww-files-public/d/d9/IT-5B_\(Basic\)_Laboratory_Techniques_\(in_Molecular_Biology\).pdf](https://s3-us-west-2.amazonaws.com/oww-files-public/d/d9/IT-5B_(Basic)_Laboratory_Techniques_(in_Molecular_Biology).pdf)
2. <https://www.jove.com/education/2/basic-methods-in-cellular-and-molecular-biology>
3. <https://study.com/academy/topic/basic-molecular-biology-laboratory-techniques.html>

	L	T	P	C	Hrs
A20BTL309	0	0	2	1	30

ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY PRACTICALS

Course objective

- To learn the Analytical techniques used in Biotechnology.

Course Outcomes

After the completion of this course, the students will be able to

- perform the Analytical techniques in Biotechnology
1. pH meter and Preparation of Buffer - Acidic and Basic
 2. molarity and normality solution preparation
 3. Isolation of sub-cellular organelles.
 4. Density gradient centrifugation
 5. Spectrophotometry (visible & UV)
 6. Paper chromatography
 7. Thin layer chromatography
 8. Column chromatography
 9. Affinity chromatography

Text Books:

1. Analytical Techniques in Biotechnology by Suzy Hill, Syrawood Publishing House
2. A Handbook of Techniques in Biochemistry and Molecular Biology by Dr.Goutham, Laxmi Publications.

References Books:

3. Basic tools and techniques in Biotechnology by Sharma Jitendra, LAP Lambert Academic Publishing.

Web References:

1. <https://scialert.net/fulltext/?doi=ajbmb.2014.1.7>
2. https://www.researchgate.net/publication/322789684_
3. <https://www.ispybio.com/search/protocols/purification%20protocol12.pdf>
4. <https://www.sigmaaldrich.com/IN/en/support/calculators-and-apps/molarity-calculator>
5. <https://www.thermofisher.com/in/en/home/life-science/protein-biology/protein-biology-learning-center/protein-biology-resource-library/pierce-protein-methods/cell-fractionation-organelle-isolation.html>

A20BTL323	APPLIED MICROBIOLOGY PRACTICALS	L	T	P	C	Hrs
		0	0	2	2	30

Course objective

- To learn the applied microbiology practicals.

Course Outcomes

After the completion of this course, the students will be able to

- To perform the applied microbiology practicals.

1. Screening of antibiotic producing microbes from soil
2. Isolation of Growth factor producing microbes
3. Isolation of Amylase producing microbes
4. Enrichment culture techniques
5. Citric acid production by fungal culture
6. Wine production
7. Mushroom Cultivation
8. Production of Microbial Biomass(SCP)
9. Immobilization of Yeast cells

Text Books:

1. Practical manual cum work book Industrial Microbiology by T.C.K.Sugitha, P.Raja, R.Rajesh and U. Sivakumar, October 2020, Publisher: Tamil Nadu Agricultural University, ISBN: ISBN:978-93-87443-16-7.
2. Gerald (Ed.) Reed. Prescott and Dunn's Industrial Microbiology, Fourth Edition, CBS Publishers and Distributors, 2004.
3. Glick BR and Pasternak JJ. Molecular Biotechnology - Principles & applications of Recombinant DNA. ASM Press, 2009
4. Alani, DI. Murray MY. Perspectives in Biotechnology and applied Microbiology. Elsevier Publication. 1986.
5. Ketchun PA. Applied Microbiology, Microbiology- Concepts and applications. Cassida Jr. Tata McGraw hill Publications, 1994.

References Books:

1. Glick BR and Pasternak JJ. Molecular Biotechnology - Principles & applications of Recombinant DNA. ASM Press, 2006.
2. Staneberry et al. Fermentation Technology, 1998.

Web references:

1. <http://shintarosalia.lecture.ub.ac.id/files/2018/09/ISOLATION-SCREENING-.pdf>
2. <https://www.basu.org.in/wp-content/uploads/2020/06/18th-PPT-of-Foods-and-Industrial-MicrobiologyCourse-No.-DTM-321.pdf>

A20BTE301

GENETICS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the History of Classical and Modern Genetics .
- To study the laws of inheritance .
- To understand the alterations of chromosome .
- To understand the Microbial Genetics .
- To study about Cytogenetics .

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the History of Classical and Modern Genetics

CO2 - Know the basic laws of inheritance .

CO3 - Understand the alterations of chromosome

CO4 - Understand the Microbial Genetics .

CO5- Understand the basic Cytogenetics .

UNIT I

(10 Hours)

History of Classical and Modern Genetics, Concept and organization of Genetic material in Bacteria, Plant and Animal; Structure, types, forms and functions of DNA and RNA. Genetic model organisms and their significance (*E.coli*, *Arabidopsis thaliana*, *Coenorhabditis elegans*).

UNIT II

(7 Hours)

Mendelian laws of inheritance; Non-Mendelian inheritance; Chromosomal theory of inheritance. Back cross and Test cross.

UNIT III

(10 Hours)

Structural and numerical alterations of chromosome- Deletion, Inversion, Duplication, Translocation. Ploidy and their genetic implications. Mutation- (Spontaneous and Induced) mutagen. Biochemical basis of mutation.

UNIT IV

(10 Hours)

Microbial Genetics: Methods of Gene transfer – Transformation, Transduction, Sexduction, Mapping genes by interrupted Matting, fine structure analysis of genes.

UNIT

(8 Hours)

Cytogenetics- Human karyotype, Banding techniques, Human genetic diseases. Pedigree analysis.

Text Books:

1. Ajoy Paul (2007). Text Book of Cell and Molecular Biology. First edition, Books Allied (P) Ltd., Kolkata.
2. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. Third edition, John Wiley and Sons, Inc. publication, New Delhi.

References Books:

3. Robertis et al., 1995 Eighth Edition. Cell and Molecular Biology -Waverly publication.
4. E.J.Gardener, M.J.Simmons and D.P.Snustad, Principles of Genetics - John Wiley & Sons Publications.
5. Strickberger, M.W., 1997. Fourth Edition.Genetics -Printice Hall, ,
6. Alberts., 2002. Molecular Biology of the Cell -. Garland publication, Fourth Edition.
7. Ajoy Paul., 2011. Text Book of Genetics- from Genes to Genomes- Books and Allied (P) Ltd, Kolkata.Third Edition.

Web References:

1. https://www.bioexplorer.net/history_of_biology/genetics/
2. <https://courses.lumenlearning.com/boundless-biology/chapter/laws-of-inheritance/>
3. <https://www.osmosis.org/answers/chromosomal-aberrations#:~:text=Chromosomal%20aberrations%20are%20changes%20in,for%20a%20total%20of%201.>



A20BTE302

GENERAL BIOLOGY

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the classification of Plants and Animals.
- To study the Structure and function of plant tissues .
- To understand the micro- and macro-nutrients .
- To understand the plant-water relations.
- To study Digestion of food, etc .

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the classification of Plants and Animals.

CO2 - Know the Structure and function of plant tissues.

CO3 - Understand the micro- and macro-nutrients .

CO4 - Understand the plant-water relations,

CO5- Understand the Digestion of food, etc.

UNIT- I

(8 Hours)

General classification of Plants and Animals, Concept of Species, Overview of Kingdoms - Animalia and Plantae, General characteristics of each group up to class level with an example.

UNIT- II

(10 Hours)

Structure and function of plant tissues: parenchyma, collenchyma, sclerenchyma. Different types of xylem and phloem. Structure and functions of animal tissues: simple epithelial tissue, connective tissues, muscle tissues and nervous tissue (Neurons).

UNIT- III

(7 Hours)

Autotrophic nutrition, Photosynthesis, micro- and macro-nutrients, overview of mineral element deficiencies in plants. Different types of heterotrophic nutrition.

UNIT - IV

(10 Hours)

Brief account of plant-water relations, types of transpiration and stomatal mechanisms, ascent of water in xylem and translocation of organic solutes in phloem, Anaerobic and aerobic respirations, Nitrogen fixation, Vegetative and asexual propagation of plants, sexual reproduction in plants (algae to angiosperm), pollination, fertilization.

UNIT - V

(10 Hours)

Digestion of food in various regions of the alimentary canal; General characteristics of blood vascular system, composition of blood, structure and functions of heart, blood clotting; Nervous system; General view of endocrine system.

Text Books:


1. D.J. Taylor, N.P.O. Green, G.W. Stout. Biological Science (3rd Edition) –Cambridge University Press. 2008.
2. Taiz, L & Zeiger, E. Plant physiology (5th edition), Sinauer Associates, Inc. Sunderland. 2010.
3. Knut Schmidt-Nielsen. Animal physiology (5th edition). Cambridge University Press. 1997.

Reference Books:

4. Raven, P.H., Evert, R.F & Eichhorn, S.E. Biology of plants (7th edition). W.H. Freeman Company publishers, USA. 2005.
6. Campbell, N.A & Reece, J.B. Biology (8th edition). Pearson Benjamin Cummings, San Francisco. 2008.

Web References:

1. <https://www.pmfias.com/five-kingdom-classification-plants-animals/#:~:text=Biological%20>



		L	T	P	C	Hrs
A20BTE303	PARASITOLOGY AND ENTOMOLOGY	3	0	0	3	45

Course Objectives

- To understand the General Consideration of parasitology.
- To study about Protozoa:
- To study about Cestode and Trematodes
- To study about Nematodes
- To study about Entomology and disease transmission

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the the General Consideration of parasitology

CO2 - Know the about Protozoa:

CO3 - Understand about Cestode and Trematodes

CO4 - Understand about Nematodes

CO5- Understand the basic Entomology and disease transmission

UNIT I

(7 hours)

General Consideration: Taxonomy, Transmission of parasites, Pathogenesis and pathology, Host immunity in parasitic infections, Clinical manifestations of parasitic infections, Laboratory diagnosis of parasitic infections, Prevention and control of parasitic infections.

UNIT II

(10 hours)

Protozoa: Entamoeba, Plasmodium, Leishmania, Giardia, Trichomonas, Balantidium, Toxoplasma and Cryptosporium - Habitat, Morphology, Pathogenesis and pathology, Host immunity in parasitic infections, Clinical manifestation and laboratory diagnosis and prevention and control.

UNIT III

(10 hours)

Cestode and Trematodes: Taenia, Echinococcus, Schistosoma, Fasciola, Paragonimus and Platyhelminthes - Habitat, Morphology, Pathogenesis and pathology, Host immunity in parasitic infections, Clinical manifestation and laboratory diagnosis and prevention and control.

UNIT IV

(10 hours)

Nematodes: Strongyloides, Trichinella, Hookworms, Ascaris, Entrobium, Trichuris, Wuchereria, Brugia, Dracunculus - Habitat, Morphology, Pathogenesis and pathology, Host immunity in parasitic infections, Clinical manifestation and laboratory diagnosis and prevention and control.

UNIT V

(8 hours)

Entomology and disease transmission: Modern concepts of Entomology, knowledge and Life cycles of arthropod vectors - ticks, mites, fleas, mosquitoes and flies, that are Capable of disease transmit in human and animals, Vector transmitted diseases in India and control measures.

Text Books:

1. Parija SC, Text Book of Medical Parasitology, Protozoology & Helminthology (3rd edition), All India Publishers & Distributors (2008).
2. Arora. D.R. and Arora, B, Medical Parasitology, (1st edition), CBS Publishers & Distributors, New Delhi (2002).
3. Easwari Nayar, Hand Book on Medical Entomology, Kalpana Printing House, Delhi (1994).

Reference Books:

4. Garcia LS, Bruckner DA. Diagnostic Medical Parasitology. American Society for Parasitology, Washington DC, (2004).
5. Colle Jc, Duguid JP, Fraser AC and Marimon BP, Mackie and McCartney's Practical Medical Microbiology, 14th edition, Churchill Livingstone (2004).

Web references:

1. <https://onlinelibrary.wiley.com/doi/abs/10.1128/9781555817381.ch132>
2. <https://byjus.com/neet/protozoa/>
3. <https://www.ncbi.nlm.nih.gov/books/NBK8282/>
4. <https://nematode.unl.edu/wormgen.htm>
5. https://entnemdept.ufl.edu/fasulo/vector/chapter_02.htm



A20BTS303	SOFT SKILLS LAB	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To train students in soft skills in order to enable them to be professionally competent
- To facilitate the students for oral communication with confidence
- To enrich the sense of social responsibility and accountability of the students
- To help the students to train them for writing different types of resumes in keeping with the demands of the corporate world
- To train the students to work with team environment

Course Outcomes

After completion of the course, the students will be able to

CO1-Enhance the soft skills and compete professionally

CO2-Speak and present the ideas with confidence

CO3-Establish Interpersonal and leadership qualities

CO4-Draft different types of effective and impressive resume that highlight their potential and expectation

CO5-Demonstrate the quality of a team player to execute and manage things in professional and personal life

UNIT I SOFT SKILLS AND PERSONALITY DEVELOPMENT (6 Hrs)

1. Soft Skills: Meaning and Importance
2. Hard Skills versus Soft Skills
3. Power of Positive Attitude – Etiquette and Manners

UNIT II COMMUNICATION SKILLS (6 Hrs)

1. Oral Communication: Forms, Types of Speeches and Public Speaking
2. Presentation: Elements of Effective Presentation and Use of Visual Aids in Presentation
3. Non-verbal Communication: Body Language and Proxemics

UNIT III INTERPERSONAL SKILLS (6 Hrs)

1. Interpersonal Skills - Relationship Development and Maintenance and Transactional Analysis
2. Negotiation- Types, Stages and Skills
3. Counseling Skills

UNIT IV EMPLOYABILITY SKILLS (6 Hrs)

1. Goal Setting
2. Career Planning
3. Corporate Skills
4. Group Discussion
5. Interview Skills - Types of Interview
6. Job Application - Cover Letter
7. Resume Preparation

UNIT V PROFESSIONAL SKILLS (6 Hrs)

1. Decision Making Skills
2. Problem Solving
3. Team Building Skills
4. Team Spirit - Time Management

Text Books:

1. Sharma Prashant, "Soft Skills Personality Development for Life Success", BPB Publications, 1st Edition, 2018.
2. Robbins & Hunsaker, "Training in Interpersonal Skills", Pearson Publication, 6th Edition, 2015.
3. Vishnu P. Singh & C. Subhas & Kapil Dev, "Employability Skills", Asian Publication, 2nd Edition, 2014.

Reference Books:

1. Ghosh, B.N, "Managing Soft Skills for Personality Development", Tata McGraw Education Publication, 1st Edition, 2012.
1. Neera Jain & Shoma Mukherji., "Effective Business Communication" New Delhi: Tata McGraw Hill Education Publication, 1st Edition, 2012.
2. Ashraf Rizwi.M, "Effective Technical Communication", Tata McGraw Hill Education Publication, 1st Edition, 2010.

Web references:

1. https://www.mindtools.com/pages/main/newMN_LDR.htm
2. <https://www.skillsyouneed.com/ips/negotiation.html>
3. <https://www.investopedia.com/terms/i/interpersonal-skills.asp>
4. <https://www.smemaxx.com/becorporateready>
5. <https://www.skillsyouneed.com/ips/interviewing-skills.html>



A20BTT410	GENETIC ENGINEERING	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamental history of Genetic Engineering
- To study about cloning vectors .
- To understand the Gene transfer techniques
- To understand about the techniques to screen the positive clones.
- To study the Applications of Genetic engineering

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the history of Genetic Engineering

CO2 - Know the basic cloning vectors

CO3 - Understand the Gene transfer techniques

CO4 - Understand the about the techniques to screen the positive clones.

CO5- Understand the Applications of Genetic engineering

UNIT-I

(10 hours)

History and basic steps involved in genetic engineering, Enzymes involved in genetic engineering (Nucleases, Restriction enzymes and their types, DNA ligases and ligation, Kinases, Phosphatases, Reverse transcriptase, Transferases, DNA polymerase), Restriction mapping.

UNIT -II

(10 hours)

Basic design of cloning vectors - plasmid (pBR322 and pUC 18/19), cosmids, phage vectors (lambda and M13), phagemid, yeast vectors (YE_p, YR_p, YI_p), shuttle vectors, BAC and YAC Expression of cloned genes - general features of an expression vector, expression of eukaryotic gene in prokaryotes - advantages and limitations.

UNIT - III

(15 hours)

Gene transfer techniques - physical (microinjection and biolistic transformation), chemical (CaCl₂ mediated transformation and Lipofection), electroporation and transduction. Selection of recombinants - blue and white screening and plus and minus screening.

UNIT -IV

(15hours)

Construction of genomic and cDNA library, PCR- steps involved, Guidelines for PCR primer designing, variants of PCR (multiplex, nested, quantitative real time, RT- PCR), applications and limitations. Blotting - southern, northern and western blotting ; Nucleic acid and immuno probes.

UNIT -V

(10 hours)

Manipulation of gene sequences by random mutations and site directed mutagenesis, Applications of Genetic engineering in industry, medicine and agriculture. Bioethics and Biosafety.

Text books:


1. Dubey R.C, Advanced Biotechnology (1st edition), Chand and Company, 2014.
2. Watson D James; et al Recombinant DNA: genes and genomes, (3rd edition), Basingstoke: Palgrave pacmillan, 2007.
3. Sathyanarayanan U, Biotechnology (2013) Books and allied (P) ltd.

Reference books:

4. Primrose Sandy B. and Richard Twyman, Principles of Gene Manipulation and Genomics (7th Edition), Wiley-Blackwell 2006.
5. Brown T. A, Gene Cloning and DNA Analysis: An Introduction, (6th Edition) Wiley-Blackwell, 2010.
6. Winnacker L Ernst, From genes to clones -Introduction to gene technology (4th edition), Panima Publishing Corporation, 2003.

Web references:

1. https://www.iatp.org/sites/default/files/Brief_History_of_Genetic_Engineering_
2. <http://www.igntu.ac.in/eContent/MSc-Biotech-02Sem- ProfBhuminath>
3. [https://www.deshbandhucollege.ac.in/pdf/resources/1589512616_Z\(H\)-VI-Bio](https://www.deshbandhucollege.ac.in/pdf/resources/1589512616_Z(H)-VI-Bio)
4. <https://www.synbio-tech.com/gene-library-synthesis/>
5. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology



A20BTT411	IMMUNOLOGY	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamentals of Immunology
- To study the Antigens & Immunogenicity
- To understand the Antigen and antibody reactions
- To understand the Structure and organization of nucleus
- To study about Immunity and tumors

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Fundamentals of Immunology

CO2 - Know the Antigens & Immunogenicity

CO3 - Understand the Antigen and antibody reactions

CO4 - Understand the structure and functions of nucleus

CO5- Understand the basic of Immunity and tumors

UNIT - I

(15 hours)

Immunology - History & Milestones, Microbial infections and host resistance. Immune response: Innate & Adaptive responses, Humoral and cell mediated Immune Responses. Structures, composition and functions of cells and organs of immune system.

UNIT- II:

(10 hours)

Antigens & Immunogenicity. Antigens - Types, properties, Haptens, Adjuvants, Toxoids, Immunoglobulins- structure, types and properties, Theories of antibody formation, Structural and genetic basis of antibody formation.

UNIT - III

(10 hours)

Antigen and antibody reactions, Immunodiagnostic methods - Agglutination, precipitations, complement fixation, RIA, ELISA and its types, Immunofluorescence, Production of Monoclonal Antibodies and Hybridoma technique.

UNIT - IV

(10 hours)

Cytokines & Chemokines - Classification, types and its functions, Complement system:
- structure, properties, functions of complement components and its pathways. Hypersensitivity reactions: Type I, II, III and IV.

UNIT - V

(15 hours)

Immunity and tumors: Types of tumors, tumor antigens, immune response to tumors. Immunodeficiency and Auto immune diseases, MHC - Structure and function of class I and class II MHC molecules, Transplantation immunology - types and mechanisms involved.

Text Books:

1. Roit, I.M., Delves P.J., Essential Immunology (10th edition), Blackwell Science, Oxford 2001
2. Immunology by Kuby, J. (7th edition) W.H. Freeman and Company, New York, 2013
3. Kumar. M.S, Leela K Sai, Microbiology and Immunology (2nd edition) Jaypeebooks 2014

Reference books:

4. Male. D and Roth. D, Immunology (8 edition), Reed Elsevier India Pvt Limited 2013.
5. Khan. F.H. The Elements of Immunology, Pearson Education India, 2009
6. Hay. F.C, Olwyn. M.R West wood, Practical Immunology (4th edition), Blackwell science 2002

Web references:

1. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/history-immunology>
2. <https://www.britannica.com/science/antigen>
3. <https://www.britannica.com/science/antibody>
4. <https://www.sigmaaldrich.com/IN/en/technical-documents/technical-article/protein-biology/elisa/antibody-antigen-interaction>
5. <https://teachmephysiology.com/immune-system/innate-immune-system/cytokines/>
6. <https://www.creative-diagnostics.com/Tumor-Immunity.htm>

A20MAD409	BIostatISTICS	L	T	P	C	Hrs
		4	0	0	4	60

Course Objectives

- To understand the Fundamentals of Cells and its types.
- To study the cell structure and cellular organization.
- To understand the structure and Functions of cell organelles.
- To understand the Structure and organization of nucleus.
- To study about Cell division.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the cells are the basic unit of life and various types of cells.

CO2 - Know the basic cell structure and basement membrane in cells.

CO3 - Understand the structure and functions of cellular organelles.

CO4 - Understand the structure and functions of nucleus.

CO5- Understand the basic mechanisms cell division.

UNIT I

(15 hours)

Introduction to Biostatistics-Definition of Biostatistics-Basic objectives, applications in various branches of science, collections of data: Internal and External data, primary and secondary data, population and sampling.

UNIT II

(10 hours)

Classification and tabulation of univariate data, graphical representation- Bar diagram-pie diagram-Histogram, frequency curves.

UNIT III

(15 hours)

Measures of central tendency - mean, median and mode. Harmonic mean, Measures of dispersion: range and co-efficient of range, standard deviation.

UNIT IV

(10 hours)

Correlation, coefficient of correlation, regression, simple regression equation, fitting of regression line.

UNIT V

(10 hours)

Statistical inference-simple sampling-student 't'-test, Chi-square test and 'F' test.

Text Books:

1. A.Goun .N.Gupta and B.Dasgupta, "Fundamentals of Statistics" vol I &II world press.
2. an introduction to Biostastics, 3rd edition,sundarrao, P.S.S and Richards, J.Christian medical college, vellore.

Reference Books:

3. Biostatistics, Danniell, W.W.,1987. New york, John wiley sons.
4. Statistics for biology,Boston,Bishop,O.N.Houghton,Mifflin.
5. statistics for Biologist, campbell, R.C.,1998. Cambridge university press.
6. Statistical Analysis of epidemiological data, selvin, S., 1991. New york University press.

Web references:

1. <https://www.sciencedirect.com/book/9780122622700/introduction-to-biostatistics>
2. https://www.uobabylon.edu.iq/eprints/publication_3_12756_638.pdf
3. <https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php>
4. <https://www.investopedia.com/terms/c/correlationcoefficient.asp>
5. <https://byjus.com/maths/statistical-inference/>



A20BTL412	GENETIC ENGINEERING PRACTICALS	L	T	P	C	Hrs
		0	0	2	1	30

Course objective

- To learn the Genetic Engineering Practicals.

Course Outcomes

After the completion of this course, the students will be able to

- To perform the the Genetic Engineering Practicals.

1. Restriction digestion of pBR322
2. Ligation of digested DNA fragments
3. Competent cell preparation
4. Transformation of bacteria - CaCl₂ method
5. Selection & screening of rDNA antibiotic resistance, blue - white colony
6. Southern hybridization
7. Isolation of total mRNA from Bacteria
8. Northern hybridization
9. Polymerase chain reaction

Text Books:

1. Laboratory Manual for Genetic Engineering (Vennison John), Publisher: PHI Learning, Genre: Science, ISBN: 9788120338142, 9788120338142.

2. A Practical Textbook of Genetic Engineering in Bacteria (English, Paperback, Sarma P V G K) Publisher: Mjp Publisher, Genre: Science, ISBN: 9789388694414
Edition: 2021.

Reference Books:

1. Genetic Engineering: Techniques and Applications by Enrique preston, Publisher: Callisto Reference ,Genre: Science, ISBN: 9781632398703, 9781632398703.

2. Genetic Engineering: Concepts, Tools and Techniques by Rosanna manna, Publisher: Syrawood Publishing House, Genre: Science, ISBN: 9781682861233, 9781682861233.

Web references:

1. <https://www.addgene.org/protocols/subcloning/>
2. <https://www.addgene.org/protocols/bacterial-transformation/>
3. <https://www.sigmaaldrich.com/US/en/technical-documents/protocol/protein-biology/gel-electrophoresis/southern-and-northern-blotting>
4. <https://www.genscript.com/pcr-protocol-pcr-steps.html>

A20BTL412	IMMUNOLOGY PRACTICALS	L	T	P	C	Hrs
		0	0	2	1	30

Course objective

- To learn the Immunology practicals
After the completion of this course, the students will be able to
- To perform the the Immunology practicals
 1. Single Immunodiffusion
 2. Double Immunodiffusion
 3. Rocket Immuno-electrophoresis
 4. WIDAL test
 5. Slide Agglutination Reaction - ABO Blood Grouping
 6. Separation of Blood, plasma and serum
 7. Extraction of antigens from microbes
 8. Western Blotting
 9. Enzyme-Linked Immunosorbent Assay

Text Books:

1. A HANDBOOK OF PRACTICAL AND CLINICAL IMMUNOLOGY VOL 2 2ED (PB 2017): Volume II Paperback – 1 January 2017 by **TALWAR and Guptha (Author)**

Reference Books:

1. Immunology: Overview and Laboratory Manual by by Tobili Sam-Yellowe, Publisher : Springer; 1st ed. 2020 edition (20 January 2021)
2. Practical Immunology A Laboratory by by Karthik Kaliaperumal und Senbagam, LAP LAMBERT Academic Publishing; 1st edition (1 January 2017)

Web references:

1. https://www.gbiosciences.com/image/pdfs/protocol/BE-501_protocol.pdf
2. <https://microbiologynote.com/blood-grouping-principle-and-procedure/>
3. <https://cinj.org/sites/cinj/files/documents/C4ProcedureForSerumAndPlasmaSeparation.pdf>
4. <https://www.healthline.com/health/elisa#procedure>

A20MAL404	BIostatISTICS PRACTICALS	L	T	P	C	Hrs
		0	0	2	2	30

Course objective

- To learn the Practical applications of Biostatistics.

Course Outcomes

After the completion of this course, the students will be able to

- apply the statistical application in Biology
1. Measurements of central tendency-mean, median and mode
 2. Measurement of central tendency- Harmonic mean, geometric mean
 3. Measurement of dispersion-standard deviation
 4. Measurement of dispersion-range
 5. Calculation of correlation coefficient values
 6. Fitting of regression equation
 7. Test of hypothesis-chi square test
 8. Hypothesis- student 't' test
 9. Hypothesis- 'F' test

Text Books:

1. A.Goun .N.Gupta and B.Dasgupta, "Fundamentals of Statistics" vol I & II world press.
2. an introduction to Biostatistics, 3rd edition, sundarrao, P.S.S and Richards, J.Christian medical college, vellore.

Reference Books:

3. Biostatistics, Danniel, W.W., 1987. New york, John wiley sons.
4. Statistics for biology, Boston, Bishop, O.N. Houghton, Mifflin.
5. statistics for Biologists, campbell, R.C., 1998. Cambridge university press.
6. Statistical Analysis of epidemiological data, selvin, S., 1991. New york University press.

Web references:

1. <https://www.sciencedirect.com/book/9780122622700/introduction-to-biostatistics>
2. https://www.uobabylon.edu.iq/eprints/publication_3_12756_638.pdf
3. <https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php>
4. <https://www.investopedia.com/terms/c/correlationcoefficient.asp>
5. <https://byjus.com/maths/statistical-inference/>

A20BTE404	DEVELOPMENTAL BIOLOGY	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the Spermatogenesis
- To study the of sperm and egg
- To understand the structure of Cell cleavage
- To understand the the Development of Microsporangium
- To study about shoot and root apical meristem

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Spermatogenesis

CO2 - Know the basic of sperm and egg

CO3 - Understand the structure of Cell cleavage

CO4 - Understand the Development of Microsporangium

CO5- Understand the basic of shoot and root apical meristem

UNIT I

(8 hours)

Spermatogenesis and Oogenesis in mammals, Menstrual cycle, Monitoring of estrus cycle, Sperm Banking. Hormones involved in reproduction.

UNIT II

(10 hours)

Activation of sperm and egg- interaction of sperm and egg - Sequence of events in sperm entry - Egg surface changes. Post-fertilization changes. Embryo development.

UNIT III

(10 hours)

Cell cleavage - pattern of cleavage - Chemical changes- Distribution of cytoplasmic substances in the egg -Metamorphosis (Insects and amphibians) -Hormone control of metamorphosis.

UNIT IV

(10 hours)

Development of Microsporangium and Megasporangium, Pollination, Embryo -Embryo sac development and double fertilization in plants, seed formation and germination. Out line of experimental embryology.

UNIT V

(7 hours)

Organization of shoot and root apical meristem, and development. Leaf development and Phyllotaxy.

Text Books:

1. Gilbert, Scott's. 10th edition (2014). Developmental biology. Sinauer Association, Inc., Publishers.
2. Chattopadhyay.S. 2016. An Introduction to Developmental Biology, Books and Allied (P) Ltd,Kolkata. First Edition.
2. Bruce M Carlson, Patten's Foundation of Embryology,. Tata McGraw Hill Co.
3. Balinsky, B.I., 1981. 5th edition. An Introduction to Embryology, W. B. Saunders Co., Philadelphia
4. Verma , P.S., Agarwal, V.K., and Tyagi., 1995. Chordate embryology, S. Chand & Co., New Delhi.

Reference Books:

- 5.Jonathan Slack. Essential Developmental Biology. (1st ed.) Blackwell Science (2001). 6.A.J.Lack and D.E. Evans, Instant notes in Plant Biology, (1st ed.) Bios Scientific Publishers Limited (2001)
- 6.Scott. F. Gilbert, Developmental Biology;(6th ed.) Sinauer Associates, INC., Publishers, Sunderland, Massachusetts. (2000).

Web references:

1. <https://www.google.com/search?q=Spermatogenesis+and+Oogenesis+notes&ei=RAo0Yra7Nbq>
2. <https://byjus.com/biology/embryo-development/>
3. <https://www.google.com/search?q=Development+of+Microsporangium>
4. <https://www.google.com/search?q=Organization+of+shoot+and+root+&source>



		L	T	P	C	Hrs
A20BTE405	BIOLOGY OF CLONING VECTORS	3	0	0	3	45

Course Objectives

- To understand the Salient features of cloning vectors
- To study the types of plasmids
- To understand the Plasmid Biology
- To understand the of lambda phage vector
- To study about Animal viruses and Agrobacterial plasmids

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Salient features of cloning vectors

CO2 - Know the basic Comparative genomics

CO3 - Understand Plasmid Biology

CO4 - Understand about lambda phage vector

CO5- Understand the about Animal viruses and Agrobacterial plasmids

UNIT I

(10 hours)

Salient features of cloning vectors- Restriction enzyme and their mode of action- Types of restriction enzymes – Recombinant DNA – Types of cloning vectors: plasmids, cosmids, single stranded M 13, SV 40 vectors, Phagemids, Shuttle vectors, Broad Host range Vectors.

UNIT II

(8 hours)

DNA phages, animal viruses, Ti plasmids, cauliflower mosaic virus. Specialized Vectors. Expression vectors, Off vectors, gene fusion vectors, Vectors for yeast, Streptomyces, Bacillus.

UNIT III

(10 hours)

Plasmid Biology: Structural and functional organization of plasmids, plasmid replication, stringent and relaxed plasmids, incompatibility of plasmid maintenance – plasmid rescue technique.- plasmids of gram positive bacteria, ColE1, R1, pT181, psc 101- plasmids of gram negative bacteria P1J101, SLP and SCP. plasmid pBR 322 construction and derivatives.

UNIT IV

(10 hours)

Biology of lambda phage- Lambda phage invitro construction of a lambda vector, classes of lambda vectors, cosmid vectors and other use. M 13 vectors and their use in DNA sequencing.

UNIT V

(7 hours)

Animal viruses and gene cloning – Agrobacterial plasmids and their use in plant genetic engineering.

Text Books:

1. Terence A. Brown, Genomes 2, (2nd edition) - Garland Science publishing, 2002.
2. R.W & Primrose S. B, Principles of gene manipulation - An introduction to genetic Engineering, Black well publishers, (5th Edition), 2000.
3. Helen Kreuzer and Adrienne Massey, Recombinant DNA and Biotechnology (2nd edition), ASM Press, 2001

Reference Books:

1. Gene Cloning – Glover 1984, oxford University press.
2. From genes to clones – Ernst Winnacker panima , publishing corporation , India 2003.
3. Recombinant DNA – Watson, gilman, Zolter, Jan witkowski, 2nd Ed, 1992, W.H. Freeman
4. Principles of gene manipulation- Old and Primrose, 4th Ed, Black well scientific publications, London, 1989..

Web references:

1. <https://www.google.com/search?q=salient+features+of+cloning+vectors>
2. <https://www.cuemath.com/geometry/vectors/>
3. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology/7.04%3A_Plasmids/



A20BTE406

MOLECULAR DIAGNOSIS

L	T	P	C	Hrs
3	0	0	3	45

Course Objectives

- To understand the Fundamentals of Genetics and diagnostics
- To study the Molecular methods
- To understand the Nuclear hybridization methods
- To understand the Allele susceptibility
- To study about Cell sorting

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Fundamentals of Genetics and diagnostics

CO2 - Know the Molecular methods

CO3 - Understand the Nuclear hybridization methods

CO4 - Understand the Allele susceptibility

CO5- Understand the Cell sorting

UNIT-I

(10 hours)

Genetics and diagnostics: General features of Chromosomes, chromosome banding patterns, banding techniques and their correlates, karyotyping, DNA profiling hybridization arrays. Early detection of diseases.

UNIT-II

(10hours)

Molecular methods: Nucleic acid extraction: principles and methods. Assessing purity and concentration of nucleic acids, PCR- basic and applied - Alu-PCR, Hot start PCR, PCR-ELISA, Arbitrarily primed PCR, *in situ* PCR.

UNIT-III

(8 hours)

Nuclear hybridization methods, Single nucleotide polymorphisms and plasmid finger printing in infections, PFGE, DGGE. Detection of mutation using ARMS-PCR and microsatellite markers.

UNIT-IV

(10 hours)

Allele susceptibility test for multifactorial disorders (Neural tube defect, cleft-lip and palate, cardiovascular disorder, male infertility)

UNIT-V

(7 hours)

Cell sorting- Flow cytometry and FACS. Neonatal and prenatal diagnosis. Sex identification in forensics.

Text Books:

1. Wilson, K. and Walker, J. Practical Biochemistry – Principles and techniques 7th edition, 2010, Cambridge University Press,
2. Primrose Sandy B. and Richard Twyman, Principles of Gene Manipulation and Genomics (7th Edition), Wiley-Blackwell 2006.
3. Brown T. A, Gene Cloning and DNA Analysis: An Introduction, (6th Edition) Wiley-Blackwell, 2010.

Reference Books:

4. Terence A. Brown, Genomes 2, (2nd edition) – Garland Science publishing, 2002.
5. Old R.W, Primrose S.B, Twyman R. M, Principles of Gene manipulation (6thed.), Wiley-Blackwell, 2002.

Web reference:

1. <https://www.google.com/search?q=molecular+genetics+and+diagnostics+notes>
2. <https://academic.oup.com/femspd/article/49/2/184/493227>
3. <https://www.google.com/search?q=nuclear+hybridization+method+notes>



A20BTS404	RESEARCH METHODOLOGY	L	T	P	C	Hrs
		0	0	4	2	30

Course Objectives

- To understand the Fundamentals of Genetics and diagnostics
- To study the Molecular methods
- To understand the Nuclear hybridization methods
- To understand the Allele susceptibility
- To study about Cell sorting

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Fundamentals of Genetics and diagnostics

CO2 - Know the Molecular methods

CO3 - Understand the Nuclear hybridization methods

CO4 - Understand the Allele susceptibility

CO5- Understand the Cell sorting

UNIT I –RESEARCH FORMULATION AND DESIGN

(6 hours)

Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

UNIT II – DATA COLLECTION AND ANALYSIS

(6 hours)

Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT, SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT III – SOFT COMPUTING

(6 hours)

Computer and its role in research, Use of statistical software SPSS, GRETL etcin research. Introduction to evolutionary algorithms - Fundamentals of Genetic algorithms, Simulated Annealing, Neural Network based optimization, Optimization of fuzzy systems.

UNIT IV –RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING

(6 hours)

Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

UNIT V –INTERPRETATION AND REPORT WRITING**(6 hours)**

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions.

Text Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
5. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.

Reference Books:

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.
3. Coley, S.M. and Scheinberg, C. A., 1990, "Proposal Writing", Sage Publications.
4. Day, R.A., 1992. How to Write and Publish a Scientific Paper, Cambridge University Press.
5. Fink, A., 2009. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications
6. Leedy, P.D. and Ormrod, J.E., 2004 Practical Research: Planning and Design, Prentice Hall.
7. Satarkar, S.V., 2000. Intellectual property rights and Copy right. Ess Ess Publications

Web reference:

1. <https://theintactone.com/2018/02/26/br-u1-topic-2-formulation-of-the-research-p>
2. <https://leverageedu.com/blog/research-design/>
3. <https://www.questionpro.com/blog/data-collection/>
4. https://en.wikipedia.org/wiki/Soft_computing
5. <http://www.aau.in/sites/default/files/Unit%203%20RESEARCH%20AND%20>

	BIOTECHNOLOGY FOR HUMAN WELFARE	L	T	P	C	Hrs
A20BTO301		2	0	0	2	30

Course Objectives

- To understand the about Agricultural Biotechnology
- To study the about Food & Dairy Biotechnology
- To understand about Biotechnology for disease diagnosis
- To understand about Biotechnology for treatment & prevention of diseases
- To study about Environmental Biotechnology

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Agricultural Biotechnology

CO2 - Know the Food & Dairy Biotechnology

CO3 - Understand the Biotechnology for disease diagnosis

CO4 - Understand the Biotechnology for treatment & prevention of diseases

CO5- Understand the Environmental Biotechnology

UNIT I (6 hours)

Agricultural Biotechnology - Organic farming. Integrated farming, Vermicompost, Crop Improvement.

UNIT II (6 hours)

Food & Dairy Biotechnology- Microbes as food, feed. Prebiotics. Probiotics. Algae - SCP, Beta carotene, Fungi as food – Mushroom. Fermented food products.

UNIT III (6 hours)

Biotechnology for disease diagnosis- Clinical diagnosis. Lab diagnosis – Microscopy, Macroscopy, Biochemical, serological & Molecular diagnosis of diseases – PCR, RT –PCR, ELISA, Karyotyping

UNIT IV (6 hours)

Biotechnology for treatment & prevention of diseases-Treatment – Symptomatic therapy, specific therapy, antimicrobials Prevention – Active immunization, passive immunization, combined immunization, herd immunity.

UNIT V (6 hours)

Environmental Biotechnology- Waste management–Solid, liquid, sewage, municipal waste Bioremediation. Bioleaching. Biodegradation.

Text Books:


1. D. Balasubramanian, C. F. A. Bryce, K. Dharmalingham, J. Green and K. Jayaraman. 1996. Concepts in Biotechnology. Universities Press.
2. Ashok K. Chauhan. 2009. A Textbook of Molecular Biotechnology. I.K. International Publishing house Pvt. Ltd.
3. Chandrakant Kokate, SS Jalalpure, Pramod H.J. 2011. Textbook of Pharmaceutical 85
4. Biotechnology. A division of Reed Elsevier India Pvt. Ltd.

Reference Books:

1. B.C. Bhattacharyya and Rintu Banerjee. 2007. Environmental Biotechnology. Oxford Higher Education Publication.
2. Krishna B Ghimire. 2000. Social change and conservation. London Earthscan Publ.
3. P.J. Delves, IS.J. Artin, ID.R. Burton and I.I.M. Roitt. 2006. Essential Immunotechnology. 12th Edition. Wiley & Blackwell.

Web references:

1. <https://www.google.com/search?q=Agricultural+Biotechnology+notes&rlz=1C1YTUH>
2. <https://www.google.com/search?q=Food+%26+Dairy+Biotechnology+notes>
3. https://www.researchgate.net/publication/301712223_Biotechnology_in_the_Diagnosis
4. <https://www.google.com/search?q=Biotechnology+for+treatment+%26+prevention+of+diseases>
5. <https://www.google.com/search?q=Environmental+Biotechnology>



	L	T	P	C	Hrs
FOOD PROCESSING					
A20BTO302	2	0	0	2	30

Course Objectives

- To understand the about Food processing
- To study the about Thermal processing
- To understand about Ionizing radiations
- To understand about Refrigeration
- To study Freezing

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the Food processing

CO2 - Know the Thermal processing

CO3 - Understand the Ionizing radiations

CO4 - Understand the Refrigeration

CO5- Understand the Freezing

UNIT I (6 hours)

Introduction to Food processing-Scope and importance; basic concepts about properties of foods: liquid, solid and gases; Equipment for raw material processing: Elementary concept of material handling in food industry, equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor, size reduction, mixing and forming, separation and concentration of food components.

UNIT II (6 hours)

Thermal processing-Degree of processing, selecting heat treatment, heat resistance of microorganisms, nature of heat transfer, protective effects of food constituents, types of thermal treatments.

UNIT III (6 hours)

Ionizing radiations-Forms of radiant's energy; ionizing radiations, sources and properties; radiation units; radiation effects; limiting indirect effects; dose fixing factors; objectives in food irradiation; safety and quality of irradiated food.

UNIT IV (6 hours)

Refrigeration-Refrigeration, cool storage and shelf life extension; cool storages with air circulation, humidity control and gas modifications (i.e. CA, MA & SA).

UNIT V (6 hours)

Freezing-Changes during freezing, rate of freezing, choice for final temperature for frozen foods, freezing methods, freezing effects. Dehydration – Dehydration, water activity and food safety / quality; methods of dehydration. Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods.

Text Books:

1. Sivasankar, B. 2002. Food Processing and Preservation. PHI, India
2. Hosahalli S. Ramaswamy & Michele Marcotte. 2005. Food Processing: Principles and Applications Hardcover, CRC Press.

References:

1. P.J.Fellows. 2009. Food Processing Technology: Principles and Practice. 3rd Edition Woodhead Publishing.
2. G. Subbulakshmi & Shobha A. Udipi, 2006. Food Processing and Preservation. New Age International Publishers, India.

Web references:

1. <https://www.google.com/search?q=Introduction+to+Food+processing>
2. <https://www.google.com/search?q=thermal+processing+of+food>
3. <https://www.google.com/search?q=ionizing+radiation+in+food+processing>
4. <https://www.coolingindia.in/refrigeration-in-food-processing-cold-chain>
5. <https://www.google.com/search?q=freezing+in+food+processing>



	L	T	P	C	Hrs
FOOD TECHNOLOGY					
A20BTO303	2	0	0	2	30

Course Objectives

- To understand the about Food chemistry
- To study the about Food Microbiology
- To understand about Food Processing
- To understand about Food Preservation
- To study about Manufacture of food products

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the about Food chemistry

CO2 - Know about Food Microbiology

CO3 - Understand the Food Processing

CO4 - Understand the Food Preservation

CO5- Understand the Manufacture of food products

UNIT I

(6 hours)

Food chemistry-Constituent of food - contribution to texture, flavour and organoleptic properties of food; food additives - intentional and nonintentional and their functions; enzymes in food processing.

UNIT II

(6 hours)

Food Microbiology-Sources and activity of microorganisms associated with food; food fermentation; food chemicals; food borne diseases - infections and intoxications, food spoilage - causes.

UNIT III

(6 hours)

Food Processing-Raw material characteristics; cleaning, sorting and grading of foods; physical conversion operations - mixing, emulsification, extraction, filtration, centrifugation, membrane separation, crystallization, heat processing.

UNIT IV

(6 hours)

Food Preservation-Use of high temperatures - sterilization, pasteurization, blanching, canning - concept, procedure & application; Low temperature storage - freezing curve characteristics. Factors affecting quality of frozen foods; irradiation preservation of foods.

UNIT V

(6 hours)

Manufacture of food products-Bread and baked goods, dairy products - milk processing, cheese, butter, ice-cream, vegetable and fruit products; edible oils and fats; meat, poultry and fish products; confectionery, beverages.

Text Books:


1. Crosby, N.T. 1981. Food packaging. Materials Applied Science Publishers, London.
2. David, S. Robinson. 1997. Food Chemistry and nutritive value. Longman group, UK.
3. Frazier, W.C. and Westhoff, D.C. 1988. Food Microbiology. 4th Edition. McGram-Hill, New York.
4. Pyke, M. 1981. Food Science and Technology. 4th Edition. John Murray, London.
5. Sivasankar, B. 2002. Food processing and preservation. Prentice Hall, New Delhi.

Reference Books:

1. Brenner, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V. 1979. Food engineering Operations. 2nd Edition. Applied Sciences Pub. Ltd., London.
2. Desrosier, N.W. 1996. The Technology of Food Preservation. CBS Publishers and Distributors, New Delhi.
3. Fennema, O.R. 1976. Principles of food science: Part I, Food chemistry, Marcel Dekker, New York.
4. Lindsay, W. 1988. Biotechnology, Challenges for the flavor and food Industries. Elsevier Applied Science.

Web reference:

1. <https://www.google.com/search?q=food+chemistry>
2. <https://www.google.com/search?q=Food+Microbiology>
3. <https://www.google.com/search?q=food+processing>
4. <https://www.google.com/search?q=food+preservation>
5. <https://www.google.com/search?q=Manufacture+of+food+products>



	L	T	P	C	Hrs
HERBAL TECHNOLOGY					
A20BTO401	2	0	0	2	30

Course Objectives

- To understand the about Food chemistry
- To study the about Food Microbiology
- To understand about Food Processing
- To understand about Food Preservation
- To study about Manufacture of food products

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the about Food chemistry

CO2 - Know about Food Microbiology

CO3 - Understand the Food Processing

CO4 - Understand the Food Preservation

CO5- Understand the Manufacture of food products

UNIT-I

(6 hours)

Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

UNIT-II

(6 hours)

Pharmacognosy - systematic position - chemical constitution and medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

UNIT-III

(6 hours)

Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; Catharanthus roseus (cardiotonic), Withania Somnifera (drugs acting on nervous system), Clerodendron Phlomoides (anti- rheumatic) and Centella asiatica (memory booster).

UNIT-IV

(6 hours)

Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds, fatty acids, tannins, glycosides and volatile oils).

UNIT-V

(6 hours)

Medicinal Plant Biotechnology: Genetics as applied to medicinal herbs - mutation - polyploidy. Plant tissue culture as source of biomedicinals - Historical developments - types of cultures - phytopharmaceuticals in tissue cultures.

Text books:

1. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
2. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994.

References books:

3. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
4. The indigenous drugs of India, Kanny,Lall, Dey and Raj Bahadur,1984. International Book Distributors.
5. yurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

Web reference:

1. <https://www.google.com/search?q=Herbal+medicines>
2. <https://www.news-medical.net/health/What-is-Pharmacognosy.aspx>
3. <https://www.google.com/search?q=Phytochemistry>
4. <https://www.google.com/search?q=Analytical+pharmacognosy&source>
5. <https://www.google.com/search?q=Medicinal+Plant+Biotechnology>



A20BTO402	VERMICULTURE	L	T	P	C	Hrs
		2	0	0	2	30

Course Objectives

- To understand the about Vermicomposting
- To study the about Physical, chemical and biological changes brought by earth worm in soil
- To understand about Optimal conditions for Vermiculture
- To understand about Basic components for vermiculture
- To study about Composting

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the about Vermicomposting

CO2 - Know about Physical, chemical and biological changes brought by earth worm in soil

CO3 - Understand the Optimal conditions for Vermiculture

CO4 - Understand the Basic components for vermiculture

CO5 - Understand about Composting

UNIT-I

(6 hours)

Vermicomposting- Definition, introduction and scope: Ecological classification: Humus feeders, Humus formers, leaf mold, top soil and sub soil types.

UNIT-II

(6 hours)

Physical, chemical and biological changes brought by earth worm in soil - burrows - drilosphere - earthworm casts.

UNIT-III

(6 hours)

Optimal conditions for Vermiculture - temperature, moisture, pH, soil type, organic matter, protection from sunlight, rain, predators - food preference.

UNIT-IV

(6 hours)

Basic components for vermiculture - Culture practices - Home - School - Industries - Vermi wash.

UNIT-V

(6 hours)

Composting - Vermicomposting - Required conditions - Methods - Advantages - Cost-Benefit analysis of Vermicomposting.

Text Books:


1. Edwards, C.A. and Bohlen, P.J. 1996, Ecology of earthworms-3rd Edition, Chapman and hall.

Reference Books:

2. Edwards, C.A. and Bohlen, P.J. 1996, Ecology of earthworms-3rd Edition, Chapman and hall.
3. Jsmail, S.A., 1970, Vermicology. The biology of earthworms. Orient Longman, London.
4. Lee, K.E., 1985. Earthworms - Their ecology and relationship with soil and land use, Academic Press, Sydney.

Web reference:

1. <https://www.google.com/search?q=Vermicomposting&source>
2. <https://www.google.com/search?q=Physical%2C+chemical+and+biological+changes>
3. <https://www.google.com/search?q=Optimal+conditions+for+Vermiculture>
4. <https://www.google.com/search?q=Basic+components+for+vermiculture>
5. <https://www.google.com/search?q=Composting+-+Vermicomposting+>



	L	T	P	C	Hrs
A20BTO403					
BIOTECHNOLOGY FOR SOCIETY	2	0	0	2	30

Course Objectives

- To understand the about Sericulture, Aquaculture ect.
- To study the about Pest control and management
- To understand about Biodegradation
- To understand about r DNA product Production
- To study about Transgenics

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the about Sericulture. Aquaculture etc.

CO2 - Know about Pest control and management

CO3 - Understand about Biodegradation

CO4 - Understand about r DNA product Production

CO5- Understand about Transgenics

UNIT I

(6 hours)

Sericulture, Aquaculture, Apiculture. Vermiculture. Mushroom technology.

UNIT II

(6 hours)

Biofertilizers, Biopesticides, Biorepellants, Pest control and management, Biomass (SCP), Bioplastics and Bioweapons.

UNIT III

(6 hours)

Bio dyes, Bio fuels – Biodiesel & Biogas. Bioindicators. Biodegradation- Role of GMO's.

UNIT IV

(6 hours)

Production of Penicillin, Recombinant Vaccines (HBV). Recombinant Insulin. Plantibodies. Vaccines in animal cells, Gene therapy.

UNIT V

(6 hours)

Transgenic animals and their applications- Mice, Sheep and Fish. Transgenic plants and their applications- BT Cotton, Flavr-Savr tomato and Golden rice.

Text Books:

1. Animal Biotechnology ,M .M. Ranga, (2000) , Agrobios (India),
2. Industrial Microbiology – A.H. Patel, MacMillan Publishers, 2005
3. A text book of Biotechnology, R. C. Dubey, (2001), Rajendra Printer.New Delhi.

References Books:

4. Introduction to Plant Biotechnology Chawla,(2003) (2nd edn) Oxford and IBH publishers
5. Biotechnology, Satyanarayana. U, (2008), Books and Allied (p) Ltd.

Web reference:

1. <https://www.google.com/search?q=Sericulture%2C+Aquaculture%2C+Apiculture>
2. <https://www.google.com/search?q=Biofertilizers%2C+Biopesticides%2C+Biorepellants%2>
3. <https://www.google.com/search?q=Bio+dyes%2C+Bio+fuels+%E2%80%93+Biodegradation>
4. <https://www.google.com/search?q=Production+of+Penicillin%2C+Recombinant+Vaccines>
5. <https://www.google.com/search?q=Transgenic+animals+and+their+applications>

