

Government College(Autonomous) Rajamahendravaram

Accredited “A⁺” Grade by NAAC

Department of Biotechnology



Syllabus for courses offered (I , II, IIIyr)

in

4 yr B.Sc. (Domain subject) Biotechnology

Under CBCS (Choice Based Credit System)

Program / Code : BBC / (2209)

Approved by Board Of Studies

(2022-2023)

Government College (Autonomous), Rajamahendravaram

Department of Biotechnology

Board Of Studies Document

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PROCEEDINGS OF THE PRINCIPAL
GOVERNMENT AUTONOMOUS COLLEGE, RAJAHMUNDRY

PRESENT: Dr.R. David Kumar, M.Sc., M.Phil., Ph.D.

RC. NO. 152/GCRJY/ACAD. CELL//BOS/2021/, DATED. 05.07. 2022

Sub: GCRJY-Conduct of BoS Meetings for the Academic Year 2022-23 - Regarding

ORDER:

With reference to the subject cited, the lecturers-in-Charge of all the departments are hereby informed to conduct their respective Board of Studies (BoS) meetings by the end of July 2022.

You are also informed to intimate the date of your BoS meeting well in advance to the subject experts/University nominee/Industrial Nominee/members of BoS/Student nominee concerned to get their valuable views and suggestions in the deliberations to frame the concrete syllabi for your subjects keeping in view the objectives of the college and interest of the stake holders. The date should also be indicated to Academic Cell in advance.

You are further suggested to utilize the academic autonomy in incorporating the additional modules in the syllabi and identify the pedagogical strategies to implement the same.

Please note that your BoS document should contain the following contents in order

- Proceedings of the Principal pertaining to BoS
- Composition of BoS
- Table showing the Allocation of Credits in the following table for both theory and Lab in case of science subjects

S. No	Semester	Course Code	Title of the Course (Paper)	Max. Marks (SEE)	Marks in CIA	Hrs./week			
						L	T	P	C

L= Lecture, T= Tutorial, P= Practical, C= Credits

- Agenda wise Resolutions adopted in the meeting with detailed discussions
- Table showing Members present with signatures
- List of Examiners & Paper setters
- Syllabus for each course in the **Proforma given** (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical)
- Unit wise Assignment questions at the end of syllabus of each course

You are requested to submit a separate document regarding addition/deletion of specific topics from the syllabus in each course (paper) with justification, if any.

ACADEMIC CELL, GOVERNMENT COLLEGE
(AUTONOMOUS) RAJAHMUNDRY

All the *new Courses/certificate courses* proposed for the calendar year 2022, Seminars/workshops, field visits, study tours for 2022-23 should be placed before the respective Board and get them approved.

You are also requested to submit 2 hard copies & 2 soft copies (CDs) of BoS document to the Academic cell along with original bills and settle the bills after completion of the BoS meeting. You can approach the Academic Cell for necessary documents.

Most Important: You are requested to submit soft & hard copies of *Resolutions (including discussion)* separately to IQAC immediately after BoS meeting is completed.



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Copy to:

1. Lecturers-in-Charge of all the departments
2. File

Government (Autonomous) College, Rajamahendravaram

Department of Biotechnology

Composition of Board of Studies Committee 2022-2023

S.No	Nominee	Name and Designation
1	Chairman	Dr.B.Nageshwari, Lecturer in Charge , Department of Biotechnology, Govt (A) College, Rjy Phone : 9866219559 email Id: b.nageshwari@gcrjy.ac.in
2	Member	Dr K.Vasudha, Lecturer , Department of Biotechnology, Govt (A) College, Rjy Phone : 9704723056 email Id: kvasudhabt@gcrjy.ac.in
3	Subject Expert	Sri. K. Suresh Babu, ABN College, Kovvuru, WG Dist. Phone :9966845824 email Id: sureshbiozeal@gmail.com
4	Subject Expert	Sri.G.Sam Babu Sri Y.N. College (A), Narsapur. Phone: 9866611379 email Id: biotechsnyamsir@gmail.com
5	University Nominee	Dr.D. Kalyani, Associate Professor of Zoology ,UCST, AKNU Phone :9849419160 email Id: dk.zoo@aknu.edu.in
6	Expert from Industry / Corporate Sector	Dr.K.Sarala Principal Scientist,Crop Improvement Division,CTRI, Rjy. Phone: 9849726890 email Id:
7	Student Nominee	Name: B.Thiruvalli Present job / study : M.Sc, Biotechnology (AKNU-RJY) Phone: 8247260790 email Id: thiruvalli2723@gmail.com
8	Student Nominee	Name: B. Lakshmi Sahitya Present job / study : M.Sc., Biotechnology (AKNU-RJY) Phone:9494434719 email Id: b1sahitya459@gmail.com 98

**Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
Board Of Studies – Committee Members : (2022-23)**

Date : 30-07-2022

Time :11:30 A.M.



Left to Right : University nominee : **Dr.D. Kalyani** , Associate Professor of Zoology ,UCST, AKNU.

Industrial expert : **Dr.K.Sarala**, Principal Scientist,Crop Improvement Division,CTRI, Rjy.

Subject Expert : **Sub Lt. G. Sam Babu** , Lecturer Dept Of Biotechnology, Sri Y.N. College (A), Narsapur.

Subject expert : **Sri. K. Suresh Babu**, Lecturer Dept Of Biotechnology , ABN College, Kovvuru, WG Dist.

Member Faculty : **Dr K.Vasudha**, Lecturer , Department of Biotechnology, Govt (A) College, Rjy

Chairman : **Dr.B.Nageshwari**, Lecturer in Charge , Department of Biotechnology, Govt (A) College, Rjy

Standing Behind :

Student Nominee 1 **B.Thiruvalli** B.Sc Biotechnology GDC(A) RJY (2018 -2021) (Now P.G. Biotechnology at AKNU, Rjy)

Student Nominee 2 **B.Lakshmi Sahithya** B.Sc Biotechnology GDC (A) RJY(2018-2021) (Now P.G. Biotechnology at AKNU, Rjy)



Deliberations - (BoS- Meeting)

Allocation of Credits , Teaching hours and Marks.

Semester	Paper	Title of course	Thero y/ Lab Hrs per week	Marks			Credits	Course code
				CI A	SEE	Total		
1	1	Biomolecules, bioenergetics & Analytical Techniques	4	50	50	100	4	BTL149
1	1	Biomolecules, bioenergetics & Analytical Techniques lab	2	-	50	50	1	BTL149P
2	2	Microbiology, Cell and Molecular Biology	4	50	50	100	4	BTL150
2	2	Microbiology, Cell and Molecular Biology lab	2	-	50	50	1	BTL150P
2 nd Sem end	CSP	Community Service Project (Log Book (30M) ; Project Implementation (20M) Project Report (25M) ; Project viva (25M)				100		
3	3	Immunology and rDNA technology	4	50	50	100	4	BTL124
3	3	Immunology and rDNA technology lab	2	-	50	50	1	BTL124P
4	4	Plant and animal biotechnology	4	50	50	100	4	BTL123
4	4	Plant and animal biotechnology lab	4	-	50	50	1	BTL123P
4	5	Environment and Industrial biotechnology	4	50	50	100	4	BTL153
4	5	Environment and Industrial biotechnology lab	2	-	50	50	1	BTL153P
4 th sem end	2 nd Internship for BBC & AGRO							
5 th sem Internship	3 rd Internship for BBC / AGRO for one of the program and below syllabus for remaining program							
5	6A	Biostatistics, Bioinformatics and IPR	3	50	50	100	3	BTL154
5	6A	Biostatistics, Bioinformatics and IPR lab	3		50	50	2	BTL154P
5	7A	Classical Genetics and Human Genetics, Biomedical Nanotechnology.	3	50	50	100	3	BTL155
5	7A	Classical Genetics and Human Genetics, Biomedical Nanotechnology. Lab	2		50	50	2	BTL155P
OR								
5	6B	Organic farming	3	50	50	100	3	BTL156
5	6B	Organic farming lab	2		50	50	2	BTL156P
5	7B	Biofertilizers and Biopesticides production	3	50	50	100	3	BTL157
5	7B	Biofertilizers and Biopesticides production Lab	2		50	50	2	BTL157P
OR								
5	6C	Apiculture	3	50	50	100	3	BTL158
5	6C	Apiculture Lab	2		50	50	2	BTL158P
5	7C	Pearl culture	3	50	50	100	3	BTL159
5	7C	Pearl culture	2		50	100	2	BTL159P
6 th sem	Internship	3 rd Internship for AGRO / BBC for one of the program and above syllabus for remaining program .						

Semester wise subjects for students

SEMESTER – I			
S.No.	Subjects	Core / Paper	Title
1	I-Language (English)		
2	II-Language (Hindi / Telugu /Sanskrit)		
3	Life Skill Courses		
4	Skill Development courses		
5	Major 1 AgroBiotechnology	Core 1	Elements Of Biotechnology
6	Major 2 AgroBotany	Core 2	
7	Major 3 AgroChemistry	Core 3	

SEMESTER – II			
S.No.	Subjects	Core / Paper	Title
1	I-Language (English)		
2	II-Language (Hindi / Telugu /Sanskrit)		
3	Life Skill Courses		
4	Skill Development courses		
5	Major 1 AgroBiotechnology	Core 2	Advanced Biotechnology
6	Major 2 AgroBotany	Core 2	
7	Major 3 AgroChemistry	Core 2	

Credits : 4

Community Service Project

SEMESTER – III			
S.No.	Subjects	Core / Paper	Title
1	I-Language (English)		English
2	II-Language (Hindi / Telugu /Sanskrit)		Hindi / Telugu /Sanskrit
3	Life Skill Courses		
4	Skill Development courses		
5	Major 1 AgroBiotechnology	Core 3	Hydroponics Cultivation
6	Major 2 AgroBotany	Core 3	
7	Major 3 AgroChemistry	Core 3	

SEMESTER – IV			
S.No.	Subjects	Core / Paper	Title
1	Major 1 AgroBiotechnology	Core 4	Techniques in Nursery Development
2	Major 2 AgroBotany	Core 4	
3	Major 3 AgroChemistry	Core 4	
4	Major 1 AgroBiotechnology	Core 5	Crop Improvement Technology
5	Major 2 AgroBotany	Core 5	
6	Major 3 AgroChemistry	Core 5	

Credits : 4

Internship / Project

SEMESTER – V			
S.No.	Subjects	Skill Enhancement Courses	Title
1	Major 1 Biotechnology	Skill Enhancement Courses (6 & 7)	6B Organic farming 7B Biofertilizers and Biopesticide production
2	Major 2 Botany	Skill Enhancement Courses (6 & 7)	
3	Major 3 Chemistry	Skill Enhancement Courses (6 & 7)	

Credits : 4
Internship / Project

**Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
Syllabus up gradation meeting 2022 -2023**

DATE: 30/ 07 / 2022

TIME: 11:30 P.M

Resolutions adopted in the Board of Studies meeting

A Board Of Studies meeting was conducted in the Department Of Biotechnology , in offline mode 30th July 2022 at 11:30 A.M. with all the Committee members to review and upgrade the syllabus for all semesters of the program offered. The members present discussed various aspects of the UG Biotechnology Syllabi, Courses offered , Model Question Papers of both Theory and Practical for B.Sc., degree program in Biotechnology that is to be implemented for the academic year 2022-2023.

The following resolutions were adopted after through discussion and approval by the committee members.

Agenda-1. To discuss, consider, propose and approve basic frame work for syllabus for all the semesters and other components like carrying out of Internships in summers and in semester 5th or 6th semester, project work presentation, thesis Submission and facing viva voce.

Discussion : The committee discussed and came to conclusion that keeping in view further education of students in the field, it is apt to adopt the basic frame work for syllabus which is prescribed by APSCHE and to modify the syllabus according to the needs of the student , department and college and it also decided to follow CBCS pattern in offering courses.

A new curriculum has been released for 5th and 6th semesters by APSCHE which also adopted from the present year 2022-23.

- ❖ 3 sets of electives (2 courses in each set) will be framed and offered to the student , of which the student will have to choose 1 set only consisting of 2 courses for the 5th semester.

❖ The students shall have to undergo 10 months mandatory internship in 3 phases for 4 yr conventional degree program:

The committee members discussed the usefulness of the internships and gave suggestions about where to send the students for 3 phases of trainings i.e., Community Service project (at the end of 2nd semester), Internship (at the end of 4th semester), Apprenticeship / On job training (one full semester 5th or 6th) for period of 2 months, 2 months and 6 months respectively.

10 months mandatory internship in 3 phases for 4 yr conventional Degree program						
S.No	Phase	Project / Inernship / Training	Duration	Time of Academic year	Evaluation / Marks	Credits
1	First phase	Community Service Project	2 months	At the end of Sem -2	Log Book (30M) Project Implementation(20M) Project Report (25M) Project viva (25M) ----- TOTAL= 100 M -----	4
2	Second phase	Internship/ Apprenticeship/ On job training	2 months	At the end of Sem 4	100 M	
3	Third phase	Internship/ Apprenticeship/ On job training	6 months (One full semester)	5 th sem or 6 th sem	Internal External (viva) ----- TOTAL = 200M -----	
At the end of 2nd and 3rd phases the student will have to present his project work, submit a project thesis, take viva .						

First phase : Community Service Project :

After 2nd semester exams (April-May) the students will take up Community Service Project for a period of 2 months.

- The following is the evaluation methodology for awarding marks/grades.
- There will be only internal evaluation for this internship.
- The assessment is to be conducted for 100 marks.
- The number of credits assigned is 4.
- Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.
The weightings shall be:

- ❖ Project Log 20%
- ❖ Project Implementation 30%
 - ❖ Project report 25%,
 - ❖ Presentation 25%

Letter grade	Remarks	% of Marks	Grade Point	Credits	Credit Point
O	(outstanding)		10	2	20
A+	(Excellent)		9	2	18
A	(Very Good)		8	2	16
B+	(Good)	75	7	2	14
B	(Above average)		6	2	12

C	(Average)		5	2	10
D	(Pass)		4	2	8
F	(Fail)		0	2	0
Ab	(Absent)		0	0	0

Second phase : After 4th semester exams (April-May) the students will take up Internship/ Apprenticeship/ On job training for a period of 2 months.

Third phase : In the 5th sem or 6th sem the students will take up Internship / Apprenticeship / On job training for 6 months (One full semester).

Resolution - 1 : It is resolved to approve and send the students for community service project for a period of 2 months during summer vacation after Iyr and to send to Biotechnology subject specific internships for a period of (2+6=) 8 months in the 5th or 6th Semester. Further the students shall fulfill the following : Submit a project thesis , present the project work and face viva voce at the end of each project for all the three projects.

Agenda 2 : To invite suggestions / recommendations by the statutory body pertaining to Research.

Discussion : The committee recommended that mandatorily the students need to come out with a publication of their project work, so that the student is serious about the project work and at the same time it is fetching to the students too in their future endeavors.

Resolution 2: It is resolved to make publications mandatory from project work and to present the project work during poster presentation at events like seminars / symposiums and conferences.

Agenda 3 : To design course objectives , course outcomes and to propose and approve topics to be introduced in to the syllabus which confer skill development , employability and entrepreneurship .

Discussion : All the committee members involved in designing course objectives , course outcomes and came up with need based objectives and outcomes . Further the syllabi was designed to attain the objectives and outcomes for the courses. Apart from the Board of Studies committee members' feedback from stakeholders and ex-students (BoS Committee – Student members) now pursuing M.Sc., in Biotechnology at AKNU was also considered in designing the syllabus. Finally a syllabus with content which confers skill development , employability and entrepreneurship to the students has been evolved. These skill development , employability and entrepreneurship development topics are highlighted in Red, Green and Yellow colours respectively.

The present syllabus and curriculum is designed to cater the following to the students :

- ✓ To improve employability rate,
- ✓ To enhance skill development

- ✓ To induce Entrepreneurship.
- ✓ To cater to local industry needs / local advantage
- ✓ To encourage research oriented thinking,
- ✓ To enable students to clear entrance exams for pursuing higher studies

Resolution 3 : It is resolved to mention the designed course objectives and course outcomes in the courses before syllabus and it is resolved to introduce such topics in the syllabus which cater to wide variety of needs of the students as mentioned above in the discussion.

Agenda - 4 : Proposing courses and Framing syllabus for I, II and III yr B.Sc., Biotechnology and carrying out deletions and introduction of additional inputs .

Discussion : The committee proposed that the syllabus for I and IIyr may be kept as it is, after carrying out required deletions and introducing additional inputs, while it has been decided by the committee to introduce altogether new courses in the fifth semester in the academic year 2022-23. 3 sets of electives (2 courses in each set) will be framed and offered to the student , of which the student will have to choose 1 set only consisting of 2 courses.

The titles of new courses in 3 sets introduced as electives are as follows

Set - 1 : 6A and 7A
➤ Biostatistics, Bioinformatics and IPR
➤ Biostatistics, Bioinformatics and IPR lab
➤ Classical Genetics and Human Genetics, Biomedical Nanotechnology.
➤ Classical Genetics and Human Genetics, Biomedical Nanotechnology. Lab
Set - 2 : 6B and 7B
➤ Organic farming
➤ Organic farming lab
➤ Biofertilizers and Biopesticides production
➤ Biofertilizers and Biopesticides production Lab
Set - 3 : 6C and 7C
➤ Techniques in Nursery Development

The

➤ Techniques in Nursery Development - Lab
➤ Crop Improvement Technology
➤ Crop Improvement Technology -Lab

course

“Biostatistics, Bioinformatics and IPR” is introduced in the 5th semester , as it was recommend by committee in the pervious year (2021-2022) during BoS meeting. Other new courses introduced in the 5th semester are also introduced after due approval by the committee.

Further The committee discussed and decided that some advanced topics of the field may be introduced as additional inputs so that the student are up to date with knowledge in the field of their study. Further some of the topics which are repeated in the courses offered by Botany department and some outdated topics may be removed. A separate document with additions and deletions is enclosed in this syllabus document.

Resolution - 4 : It is resolved to continue same syllabus for semesters 1,2,3, and 4 with introduction of advanced topics as additional inputs and removal of outdated and those topics offered in the courses offered by Botany department to the same students. A separate document with additional inputs and deletions is provided in the document. Futher it resolved to introduce altogether new courses for fifth semester in the academic year 2022-23 the approved course titles are mentioned above in the discussion part and approved syllabus is enclosed this BoS document 2022-23.

Agenda - 5 : To review the practical syllabus for all the courses.

Discussion: The members of the committee discussed and came to conclusion that instead of having high end practical in the syllabus which are not possible to carry out with “hands on” by every student, the practical which are feasible to carry in and around the department / college may be introduced

Resolution - 5 : It is resolved to introduce such practical in to the syllabus which are feasible to carry out in the department / college.

Agenda 6: Identification and approval of unit wise assignment questions.

Discussion : Keeping in view the addictive nature of students to the phone, it is decided by the committee to give internet based assignments to the students to inculcate the habit of using the gadget in a resourceful manner. Further the topics which enhance skills , employability and entrepreneurship have been decided upon to be assigned to the students.

Resolution - 6: it is resolved to give internet based assignments to the students and such topics which enhance skills , employability and entrepreneurship.

Agenda - 7 : To propose and approve the allocation of marks for internal and external components.

- **Discussion** : The committee members discussed and recommended that the college specific allocation of Internal component (CIA : SEE as 50:50) prepared by IQAC, GDC (A) RJY as recommended by Autonomous, may be adopted. Further parts of components were chosen from the internal choices offered by the college specific allocation and finally department specific allocation was evolved, which is shown below. Further the following approved pedagogy techniques for internal assessment are also mention below.

Department of Biotechnology
Department Specific : Allocation of Internal component
Common for all the semesters.

S.No.	Component				Distribution of Marks
1 CIE I	Q No		Learning Objective		CIE I (after completion of 50% of syllabus)
	1		Memory based (Remember)		
	2		Understand (Comprehension)		
	3		Application		
	4		Analysis		
	5		Evaluation		
	6		Creativity		
			TOTAL		
					20
2	CIE II (Online Exam)				10
3	ATTENDANCE		Above 95%	5	5
			91% to 95%	4	
			86% to 90%	3	
			81% to 85%	2	
			75% to 80%	1	
			Below 75%	0	
Pedagogical Strategies					
4	ASSIGNMENT				5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey				5
		Participation	Second Prize	First Prize / Best Paper	
	Workshop/ Seminar/ Technical Symposium	2	3	5	
	National / International Conference	3	4	5	
6	Viva-voce/ chart preparation with diagrams				5
TOTAL					50

7. The assessment component is designed as follows:

For all I, II & III year students (CBCS pattern) Theory examination:

Internal exam (CIA)	- 50 marks	Assessment through new pedagogical methods
SEE exam	- 50marks	
Total	-100 M	

8. Practical exam would be conducted at the end of each semester for BSc I, II year.

- Internal practical exam at the end of 1st, 3rd and 5th each for - 50marks.
- External practical exam at the end of 2th, 4th, and 6th semester each for - 50marks.

9. Studying 7th and 8th semesters is optional, if the students continue to study 7th and 8th semesters, they will be trained in Research methodology.

The scheme of Model question papers for each course is framed at the end of the syllabus.

✓ A minimum of 120 credits should be earned to complete an under graduate course.

*Extra credits can be earned through Extension activities for better future opportunities

*It is mandatory to pursue a **certificate course in** semester-3 (for a complete Calendar year)

Internal assessment: **50 marks**

External assessment: **50 marks**

Total: 100 marks / (02 credits)

*Enrolment and completion of Course in SWAYAM “MOOCs” will be entitled to earn an additional 1 credit.

Approved Pedagogical Techniques considered for Internal Assessment

- ✓ P1 – Lecture
- ✓ P2- Demonstration
- ✓ P3- Question & Answer
- ✓ P4- Discussion, Debate or Collaboration
- ✓ P5- Audio & Video
- ✓ P6- Virtual or Online learning
- ✓ P7- Assignment or Case Study

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Department Best Practices for

CIA:

1. Weekly wall magazine : Poster
Presentation on notice board.

2. Extension service: Awareness
programme/ rally

- ✓ P8- Study (Research) Project
- ✓ P9- Hands on Study
- ✓ P10-Class Seminar
- ✓ Px1- Quiz
- ✓ Px2- Brainstorming
- ✓ Px5- Peer review
- ✓ Px6- Games & Puzzles
- ✓ Px7- Tutorial
- ✓ Px8- Display of Newspaper clipping
- ✓ Px9- Invited lecture
- ✓ Px10 – Group learning Px11 -Bulletin board,
- ✓ Px12 -Open text book study
- ✓ Px13 - Student magazine,
- ✓ Px14 -Report/Review writing
- ✓ Px15 - Diagrams in text book
- ✓ Px16 -3-D Models,
- ✓ Px17 -Drawing (maps)/charts
- ✓ PT – Test,
- ✓ *Google classroom

- ✓ *Project based teaching

Resolution - 7: It is resolved to follow the evolved Biotechnology Department specific Allocation of Internal component and external component (CIA : SEE as 50:50) .

Agenda - 8 : To propose and approve model question papers for Theory and Practical of external assessment.

Discussion : The committee members discussed and keeping in view the various activities in the curriculum approved the model question paper with 50% choice. One essay and one short answer question is to be framed from each unit including additional input. Further it decided to continue the same pattern of question paper for practical exam. The model question of both theory and practical papers are enclosed in the BoS document 2022-23.

Resolution - 8: It is resolved to continue the same pattern of question paper with 50% choice in section –A essay, and Section – B ,short answer type questions for theory .It is resolved to continue the same pattern of question paper for Practical exam.

Agenda - 9 : Identifying / approving potential paper setters and examiners.

Discussion : The committee approved the list of colleges proposed for setting the question paper and for acting as evaluators of exam – answer scripts. State wide colleges which are offering Biotechnology have only been selected.

Resolution - 9 : It is resolved to approve the list of colleges proposed by the department of biotechnology for setting papers and for acting as examiners.

Agenda - 10: Propose and approve co- curricular activities .

Discussion : The committee members discussed and proposed that students should be taken on a field trip at least once in an year so that they can gain practical knowledge about various aspects in the field of their study. Further the committee proposed that once in every semester a guest lecture may organized . It is suggested that eminent personalities in the filed may be invited for delivering the talk. It was decided that the students may be made to learn the innovations and day to day importance of biotechnology and research development through Biotechnology news

Resolution - 10: It is resolved to take the students of I yr and II yr for “Educational tour” or “Field trip” , organize a “Guest lecture” every semester and to make the students subscribe to Biotechnology news.

Agenda - 11 : To propose and approve extra curricular activities for the department.

Discussion : The committee proposed that birth anniversaries of eminent scientists in the field may be celebrated to make the students aware of the contribution of scientists and also to motivate them to contribute to the field . It is decided to celebrate the birth anniversaries of Karl Ereky (Father Of Biotechnology) on 20th Oct , Kary B Mullis (Inventor of PCR technique) on 28th Dec , Alexander Fleming (Discoverer of antibiotic Penicillin) on 6th Aug. Further it is proposed that some useful activities like webinars / seminars or awareness campaigns and lab to school activities may be conducted on these days.

Resolution - 11: It is resolved to celebrate the birth anniversaries of of Karl Ereky on 20th Oct , Kary B Mullis on 28th Dec , Alexander Fleming on 6th Aug by the department of biotechnology by organizing some useful event like seminar, awareness campaigns and lab to school extension activities.

Agenda - 12: To propose and approve the certificate course offered by the department of biotechnology.

Discussion : After thorough discussion the committee proposed that for a certificate course with topics exclusively based on techniques may be offered. As the techniques are likely to increase the employability opportunities of the student.

Resolution - 12: It is resolved to run the certificate course titled “ Biophysical and microbiological techniques”.

Agenda - 13: To propose and approve courses offered in the Agro biotechnology Program .

Discussion : Depending on the feedback provided by the students pursuing master’s degree and also based on Suggestions provided by the committee, it is concluded that separate courses need to be offered for agro Biotechnology right from semester 1 itself hence is it approved to prepare a separate BoS document for the program Agro biotechnology.

Resolution - 13: It is resolved to introduce Agro biotechnology based separate courses for the Agro biotechnology program from semester - 1 itself and to prepare a separate BoS document for the program Agro biotechnology .

Agenda - 14 : Identification of events to carried out by the department for the academic year 2022-2023 and to propose and approve the approximate amount to meet the expenses for carrying out approved activities.

Discussion : The committee members discussed and suggested that the department should plan for the following events 1. Filed trip, 2. Webinar / seminar 3. Observation of Birthdays of eminent Scientists in the field. 4.Awareness rallies, 5. Mounting informative posters on department notice board on daily/weekly basis. 6. Carrying out mini projects in the department. 7. Biotechnology Club Activities. 8. Celebration of Science day on 28th Feb of every year. The estimated budget was worked out and an amount of Rs 85,500 was approved. The estimate sheet with signnatures of committee members is enclosed in this BoS document for reference.

Resolution - 14 : It is resolved to observe the above mentioned activities proposed by the committee and to approve the budget estimate of Rs 85,000 -00 that is most likely to be incurred for carrying out the events. Activities not mentioned in any of the above discussion but which are found to be useful to the students may be carried out by meeting the expenses from the approved budget estimate only after due permission from concerned authority (IQAC / Academic cell / Principal)

Government (Autonomous) College, Rajamahendravaram
Department of Biotechnology
Board of Studies Meeting : 2022-23.

The Board of Studies meeting of the Department of Biotechnology was convened at 11:30 a.m. on 30th July 2022 under the Chairmanship of Dr.B.Nageshwari. Assistant professor, In charge, Department of Biotechnology.

S.No	Nominee	Name and Designation	Signature
1	Chairman	Dr.B.Nageshwari, Lecturer in Charge , Department of Biotechnology, Govt (A) College, Rjy Phone : 9866219559 email Id: b.nageshwari@gcrjy.ac.in	B. Nageshwari 30/7/22
2	Member	Dr.K.Vasudha, Lecturer , Department of Biotechnology, Govt (A) College, Rjy Phone : 9704723056 email Id: kvasudhabt@gcrjy.ac.in	Dr.K.Vasudha 30/7/2022
3	Subject Expert	Sri. K.Suresh Babu, Head,Dept.of Biotechnology ABN College, Kovvuru, WG Dist. Phone : 9966845824 email Id: Sureshbiozeal@gmail.com	K.Suresh Babu 30.07.2022
4	Subject Expert	Sub.Lt.G. SyamBabu, Head,Dept.of Biotechnology Sri Y.N. College (A), Narsapur. Phone : 9866611379 email Id: biotechsyanisri@gmail.com	Sub.Lt.G. SyamBabu 30/7/22
5	University Nominee	Dr.D. Kalyani, Associate Professor of zoology, UCST, AKNU Phone : 9849419160 email Id: dk.200@aknu.edu.in	D. Kalyani 30/7/2022
6	Expert from Industry / Corporate Sector	Dr.K.Sarala Principal Scientist, Crop Improvement Division, CTRI, Rjy. Phone email Id:	Sarala.K 30/7/22
7	Student Nominee	Name: B.Thiruvalli Present job / study M.Sc. Biotechnology. Phone : 8247260790 email Id: thiruvalli2723@gmail.com.	B.Thiruvalli 30/07/2022
8	Student Nominee	Name: B.Lakshmi Sahitya Present job / study M.Sc Biotechnology Phone : 9494434719 email Id: blsahitya459@gmail.com	B.Lakshmi Sahitya 30/7/22

Government College(A) ,RajahendravaramDepartment Of Biotechnology

S. No	Name of the college
1.	PR college(A),Kakinada
2.	Ideal Degree College(A),Kakinada

List of colleges for engaging Examiners/ Paper setters

3.	ASD Govt.College for Women, Kakinada
4.	VSLakshmi College, Kakinada
5.	DNR college(A),Bhimavaram, W.G.Dist.A.P
6.	K.G.R.L College(A), Bhimavaram, W.G.Dist.A.P
7.	Sir CR Reddy College(A), Eluru, W.G.Dist.A.P
8.	Sri Y.N.College(A),Narsapur, W.G.Dist.A.P
9.	S.K.B.R college(A),Amalapuram
10.	VS Krishna Govt.College, Visakhapatnam
11.	Women'scollege, Visakhapatnam
12.	Andhra Loyola College, Vijayawada
13.	Govt. college for Men,Srikakulam
14.	Govt. college for Women, Srikakulam
15.	S.V.K.P. & Dr. K.S. Raju Arts & Science College, Penugonda, W.G.Dist.A.P
16.	ABNcollege, Kovuru, W.G.Dist.A.P

**New Courses introduced in Program : Agrobiotechnology
For Academic year 2022-23**

Semester	Paper	Title of course	Course code
1	1	Elements of Biotechnology	BTL201
1	1	Elements of Biotechnology- lab	BTL201P
2	2	Advanced Biotechnology	BTL202
2	2	Advanced Biotechnology-Lab	BTL202P
3	3	Hydroponics cultivation	BTL203
3	3	Hydroponics cultivation -- lab	BTL203P
4	4	Techniques in Nursery Development	BTL204
4	4	Techniques in Nursery Development - lab	BTL204P
4	5	Crop Improvement Technology	BTL148
4	5	Crop Improvement Technology - lab	BTL148P
Skill Enhancement Courses			
6	6A	Apiculture	BTL206
6	6A	Apiculture -Lab	BTL206P
6	7A	Pearl culture	BTL207
6	7A	Pearl Culture Lab	BTL207P
6	6B	Organic farming	BTL156
6	6B	Organic farming lab	BTL156P
6	7B	Bio fertilizers and Bio pesticides production	BTL205
6	7B	Bio fertilizers and Bio pesticides production Lab	BTL205P
6	6C	Vegetable Science	BTL143
6	6C	Vegetable Science - Lab	BTL143 P
6	7C	Plant and Environmental Biotechnology.	BTL208
6	7C	Plant and Environmental Biotechnology - Lab	BTL208

Government College (Autonomous) Rajamahendravaram
Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members
to be implemented in the syllabus after review

Suggestion : We Students (Student members of BOS)
Requested the members of BOS-Biotechnology
(2022-2023) to include fundamentals of Biotechnology
which will be useful for clearing entrance exams/
Job interviews.

As a student of Agso BBC student of department of
Biotechnology (2018-2021) requested the members
of BOS to offer separate courses of Agso BBC
in semester 1st and 3rd also

Proposed by :- Name :

B. Thiruvalli

B. Lakshmi Sahitya

Signature:

B. Thiruvalli

30/7/22.

B. Lakshmi Sahitya

30/07/2022.

Government College (Autonomous) Rajamahendravaram

Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members

to be implemented in the syllabus after review

Suggestion :

1. For introducing the "Fundamentals of the Biotechnology." for Agro Biotechnology Students.
2. Conducting Workshops, Seminars, Poster presentations, important eminent Scientist birthdays to motivate the students to learn the innovative day-to-day importance of Biotechnology News, Research development.
3. For Project work publication is must

Proposed by :- Name :

Signature: K. Suresh Babu

30.07.2022

K. SURESH BABU
HOD, Dept. of Biotechnology
AR & PR College,
KOVVUR.

Government College (Autonomous) Rajamahendravaram

Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members

to be implemented in the syllabus after review

Suggestion :

- Introduce "fundamental of biotechnology" course for Sem-I for Agro-biotech program.
 - Course* on "Crop Improvement" may be introduced in Sem-III to give comprehensive understanding of improving crops.
 - The topics on Biostatistics, Bio-informatics and IPR may be suitably incorporated.
- Organic farming → Unit 3 may be dealt at the end of the course.
- Syllabus revised during BOS may be followed.

Proposed by :- Name : K. SARALA Signature:

Sarala.K
30/7/22

Government College (Autonomous) Rajamahendravaram
Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members
to be implemented in the syllabus after review

Suggestion :

Additional inputs for Paper - I

Unit - III

HPLC
Deletion of Paper - I

Unit - V :

Measurement of radioactivity

Proposed by :- Name :

K. SURESH BABU
HOD, Dept of Biotechnology
AON & PRR College
Kovva.

Signature:

K. S. (Signature)
30.07.2022

Government College (Autonomous) Rajamahendravaram

Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members

to be implemented in the syllabus after review

Suggestion :

- Additional inputs for II Semester
- ① DNA Replication in Eukaryotes,
 - ② Acetylation
 - ③ Introns & Exons,

Proposed by :- Name :

Sub. H. P., Syam Babu.

Signature:

S-H-P
30/2/22

Government College (Autonomous) Rajamahendravaram
Department Of Biotechnology

Discussions and Suggestions Proposed by BOS members

to be implemented in the syllabus after review

- Suggestion :
- ⊗ Introduce Fundamentals of Biotechnology for Agronomy students (Ist semester) to Agrobiotechnology program,
 - ⊗ my suggestion regarding final years students
⊗ Introduce Genetics (Human genetics) ~~one~~ paper,
one paper,
 - ⊗ Biostatistics, Bioinformatics, IPR, Patents

Proposed by :- Name :

Sub. Lt. G. Samsel

Signature:

S-D-G
30/7/22

Program Specific Outcomes

B.Sc., B.B.C.(Biotechnology, Botany and Chemistry)

The program **Biotechnology, Botany and chemistry** has been introduced to prepare the students for a career which finds application and provides solution to some of the major contemporary problems on the earth i.e., providing food for growing population, designing advanced medical treatment options for increasing–evolving diseases, to find solution to deteriorating environment caused due to overexploitation/misuse of natural resources etc.,

In this program the study of botany offers the understanding about origin of life and the scope to manipulate the knowledge for better society through catering to the needs and growing demands of food and clothing to population.

In this program the knowledge about the subject chemistry comes in to play when structures of biomolecules and their interactive relations to the environment are to be understood.

Finally the subject biotechnology amalgamates the various disciplines of sciences and offer ethically acceptable knowledge to bring about sustainable solutions for a variety of problems related to agriculture, environment to improve quality of human life. These problems are solved with responsibility using appropriate tools while keeping in mind safety factor of environment and society.

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Government College (Autonomous) Rajahmundry

Department Of Biotechnology

Theory Syllabus Paper - 1	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Biomolecules, Bioenergetics and Analytical techniques ” Course Code: BTL149	Group : BBC Year -1 Semester : 1			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lecture	T Tutorial	P Practical	C Credits
Pre-requisites:	<ul style="list-style-type: none">➤ Basic knowledge about biomolecules such as carbohydrates, amino acids, proteins, nucleic acids.➤ Basic knowledge about centrifugal force , separation of molecules , movement under electric force .	4	2	-	4

Course Objectives:

- To ensure that students gain knowledge about the structure, properties, functions and importance of Biomolecules
- To know the techniques of separation and analysis of biomolecules for characterization .

On Completion of the course, the students will be able to-

CO1	The students will have maximum knowledge on biomolecules.
CO2	Students will be able to handle biophysical and biochemical techniques .
CO3	Students gains knowledge about structure, properties and functions of biomolecules.
CO4	Students will be able to characterize biomolecules using analytical techniques.
CO5	Students are able to validate biological samples

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>Carbohydrates, Classification, structure, properties of carbohydrates Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins Denaturation and Renaturation Of proteins.</p>	<p>Employability</p>	<p>Basic Principles Of Sedimentation And Types Of centrifugations. Principles And Types Of electrophoresis ,factors affecting electrophoretic migration . PAGE</p>	<p>Entrepreneurship</p>	<p>Beer-Lambert law, light absorption Introduction to radioisotopes, measurement of radioactivity</p>
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Syllabus: “ Biomolecules, Bioenergetics and Analytical techniques”.

Unit-I- Biomolecules :

Classification, structure, properties of carbohydrates. Classification, structure and properties of amino acids, peptide bond and peptides. Classification, structure (primary, secondary, tertiary, quaternary) and functions of proteins. Denaturation and Renaturation of proteins. Classification structure and properties of saturated and unsaturated fatty acids. Structure and functions of glycolipids, phospholipids, and cholesterol.

Unit-II-Biomolecules and Bioenergetics :

Structure and functions of DNA and RNA. Source, structure, biological role and deficiency manifestation of vitamin A, B, C, D, E and K. Free energy, entropy, enthalpy and redox potential. High energy compounds, Glycolysis, TCA cycle, Electron-Transport System and Oxidative Phosphorylation.

Unit-III-Centrifugation, Chromatography :

Basic principles of sedimentation and types of centrifugations. Principle, instrumentation and application of partition, absorption, paper, TLC, ion exchange, gel permeation, affinity chromatography.

Unit –IV- Electrophoresis :

Basic principles and types of electrophoresis, factors affecting electrophoretic migration. PAGE (Native, SDS-PAGE). Introduction to 2D & Isoelectric Focusing.

Unit-V-Spectroscopy, and Laser Techniques :

Beer-Lambert law, light absorption and transmission. Design and application of photoelectric calorimeter and UV-visible spectrophotometer. Introduction to crystallography and application. Introduction to radioisotopes ,measurement of radioactivity(scintillation counter and autoradiography).

. Additional Input :

Unit I : Diseases arising due to deficiency or errors in synthesis or metabolism of carbohydrates, aminoacids, proteins , fattyacids.

Unit II : Uncouplers

Unit III : HPLC.

Unit IV : Paperelectrophoresis.

Unit V : Measurement of radioactivity and Applications of radioisotopes in biology.,

References:

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H. Freeman and Company, NY
6. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA
7. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA
8. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY
9. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K. Upadhyay, and N. Nath
10. Enzymes: Biochemistry, Biotechnology & Clinical Chemistry, (2001), Palmer Trevor, Publisher: Harwood Pub. Co., England.
11. Analytical Biochemistry, 3rd edition, (1998), David Holmes, H. Peck, Prentice-Hall, UK
12. Biochemistry, 5th Edition, 2020 U. Satyanarayana, Elsevier India.


WebLinks:

1. <https://en.wikipedia.org/wiki/Carbohydrate>
2. <http://biomodel.uah.es/en/model3/ac-gr.htm>
3. <http://biomodel.uah.es/en/model3/aa.htm>
4. <http://biomodel.uah.es/en/model3/vits.htm>
5. <http://biomodel.uah.es/en/model4/dna/>

CO-PO Mapping:

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-Iyr Semester-1 Paper- 1	Title of the Course Biomolecules, Bioenergetics & Analytical Techniques Course Code : BTL149 Semester End Exam (2022-23)	
Time: 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part-A

I. Essay questions: answer any THREE

3X10=30M

Each answer carries TEN marks.

- Question1 from Unit I
- Question2from Unit II
- Question3 from Unit III
- Question4 from Unit IV
- Question5 from Unit V
- Question6 from additional input


Part-B

II. Short answer questions : answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question7:fromUnitI
- Question8:fromUnitI
- Question9:fromUnitII
- Question10:fromUnit II
- Question11:fromUnit III
- Question12:fromUnit III
- Question13:fromUnit IV
- Question14:fromUnit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-Iyr Semester-1 Paper- 1	Title of the course “ Biomolecules, Bioenergetics & Analytical Techniques ” Course Code : BTL149 Semester End Exam (2022-23)	
Time: 2 1/2 Hrs	Model Question Paper	Marks : 50

PART-A

I. Answer any THREE questions. (Each answer carries TEN marks) 3X10 =30M

1. Write about classification, structure and properties of amino acid.
2. Write about structure and classification of saturated and unsaturated fatty acids
3. Explain biological role and deficiency manifestations of vitamin–A,C,D and K
4. Explain Glycolysis process with a flowchart
5. Explain gel filtration chromatographic technique
6. Describe the applications of radioisotopes in biology

PART-B

II. Answer any FOUR questions. 4X5=20M

Each answer carries FIVEmarks.

1. Denaturation and Renaturation of Proteins
2. Structure of cholesterol
3. Entropy and Enthalpy
4. Beer-Lambert's law
5. Extinction coefficient
6. Epimers
7. Antioxidants
8. Mitochondria



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper -1	Subject : Biotechnology	Program : B.Sc Group : BBC Year -I Semester : 1			
	Title of the Practical Course “Biomolecules, Bioenergetics& Analytical Techniques” - Lab				
	Course Code: BTL149P				
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tutorial	P Practical	C Credits
Pre- requisites:	Handling of pipettes. Preparation of Solutions Handling of analytical instruments.	0	0	2	1

Objectives:

1. The students should be able to understand the principle behind the estimations.
2. The students should be able to understand the concept and application of tests

List of Experiments/Syllabus:


1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record
2. Calculation of molarity, normality and molecular weight of compounds.
3. Qualitative analysis of carbohydrates(sugars)
4. Quantitative analysis of carbohydrates by using DNS reagent
5. Quantitative estimation of protein –Lowry’s method
6. Estimation of DNA by diphenylamine reagent
7. Estimation of RNA by orcinol reagent
8. Preparation of standard buffer and pH determination
9. Separation of amino acids by paper chromatography

Referencebooks:


1. An Introduction to Practical Biochemistry, 3rd Edition, (2001), David Plummer; Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India
2. Biochemical Methods,1st Edition, (1995), S.Sadashivam, A.Manickam; New Age International Publishers, India

Virtual LabLinks:

<https://vlab.amrita.edu/?sub=3&brch=63> <http://biotech01.vlabs.ac.in/>
<https://www.asbmb.org/education/online-teaching/online-lab-work>

	Government College (Autonomous) Rajahmundry Department Of Biotechnology		
	Subject : Biotechnology		Group : BBC
B.Sc.-Iyr Semester-1 Paper- 1	Title of the course “ Biomolecules, Bioenergetics & Analytical Techniques-Lab ” Course code: PTL149P Semester End Exam (2022-23)		
Time : 3Hrs	Practical - Model Question Paper	Credits : 1	Marks : 50

1. Estimate the concentration of DNA in the given sample by Diphenyl amine method 15M
 2. Write principle and protocol for paper chromatography and separate and identify the given amino acids 10M
 3. Spotter(3x 5) 15M
 4. Record 5M
 5. Viva– voce 5M
- TOTAL = 50M**

		Government College (Autonomous) Rajahmundry Department Of Biotechnology			
Theory Syllabus Paper-2	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Microbiology, Cell and Molecular Biology ” Course Code: BTL150	Group : BBC Year- I Semester : 2			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lecture	T Tutorial	P Practical	C Credits
Pre-requisites:	<ul style="list-style-type: none"> ➤ knowledge about basic microbial structure and life ➤ should know about basic structure of cell and its basic functions ➤ knowledge on molecular biology basics 	4	2	-	4

Course Objectives:

- To ensure students gain understand the importance of microbiome present in every part of the nature .
 - knowledge about the microbiology, cell and molecular biology aspects

On Completion of the course, the students will be able to-	
CO1	Students acquire knowledge on concepts of microbiology, cell and molecular biology.
CO2	This course give an understanding of the basics of microbiology
CO3	This course also gives knowledge to deal with types of microbes, classification and their characterization,
CO4	structure and function of prokaryotic and eukaryotic cell organelles, cell division can be understand
CO5	Students have basic knowledge on basics of molecular biology including DNA replication, transcription, translation and regulation of gene expression

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>Concepts of microbial species and strains</p> <p>Microbial of penicillin. General characteristics, transmission and cultivation of viruses.</p> <p>Structure, properties and functions of cellular organelles</p>	<p>Employability</p>	<p>Genetic code, prokaryotic and eukaryotic transcription, enzymes involved in transcription. Post-transcriptional modification (Capping, Polyadenylation) and splicing. Role of antibiotics in regulating the transcription and translation</p>	<p>Entrepreneurship</p> <p>Types and design of microscope s- compound, phase contrast, fluorescent electron microscopy (TEM, SEM). Ultrastructure of bacteria and growth curve. Pure culture techniques. Sterilization techniques,</p>
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Syllabus : “ Microbiology, Cell and Molecular Biology ”

Unit-I - Scope and cope and Techniques of Microbiology : Types and design of microscopes (- compound, phase contrast, fluorescent electron microscopy (TEM, SEM)). Ultrastructure of bacteria and growth curve. Pure culture techniques. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Simple, Gram and acid-fast staining.

Unit – II : Bacteria : Bacterial toxins, tuberculosis, typhoid. Microbial production of penicillin.
Viruses: General characteristics, transmission and cultivation of viruses. Structure and properties of plant (tobacco mosaic virus, TMV), animal (Newcastle disease virus, NDV), human (Human immunodeficiency virus, HIV) and bacterial viruses (T4 phage). Emerging and re- Emerging viruses (dengue virus), zoonotic viruses (rabies, SARS-CoV-2).

Unit-III-Cell Structure and Functions : Ultra Structure, of eukaryotic cell with note on properties and functions of various cellular organelles. Cell cycle and , Mitosis vs Meiosis. Chemical composition and dynamic nature of the cell membrane, cell signaling and communication, endocytic pathways.

Unit-IV-DNA Replication, Repair and Regulation of Gene Expression : DNA replication in prokaryotes (semiconservative, dispersive, conservative, uni and bi-direction, rolling circle). Process - Enzymes and proteins involved in DNA replication. DNA damage and repair. Regulation of gene expression in prokaryotes Lac .

Unit–V-Central Dogma of Molecular Biology : Genome organization of prokaryotic and eukaryotic organisms. Genetic code, prokaryotic and eukaryotic transcription, enzymes involved in transcription. Post-transcriptional modification (Capping, Polyadenylation) and splicing.

Translation: mechanism of translation ⁴⁶m prokaryotic and eukaryotic cells (initiation, elongation, termination). Post-Translational modification (glycosylation and phosphorylation).

unit no:	Additional input:	Deletion	Justification
1	Contribution of various scientists to the field of microbiology (Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming).	History related to scientists	
2	Classification of bacteria based on morphology, nutrition and environment	Concepts of microbial species and strains.	
3	Note on all eukaryotic cell organelles Mitosis Versus Meiosis	Mitosis and meiosis	
4	Trip operon concept.	Nil	
5	Role of antibiotics in inhibiting the transcription and translation process	Nil	

References:

1. Microbiology–6thEdition,(2006),PelczarM.J.,ChanE.C.S.,KriegN.R.;TheMcGraw Hill CompaniesInc.NY
2. Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, JoanneWilley,LindaSherwood,LindaMSherwood,ChristopherJWoolverton,ChrisWoolverton;McGrawHillScienceEngineering, USA
3. TextbookofMicrobiology, AnantnarayanandPaniker(2017)
4. Brockbiologyofmicroorganisms, 2003, Brock, T. D., Madigan,M. T.,Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall,2003.
5. Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones andBarlettInc. USA
6. Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D.,Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.; Cold SpringHarbour Lab.Press, Pearson Pub.
7. MolecularBiology,5thEdition,(2011),WeaverR.;McGrawHillScience.USA
8. Fundamentals ofMolecularBiology,(2009),PalJ.K.andSarojGhaskadbi;OxfordUniversityPress.
9. Molecular Biology: Genes to Proteins, 4th edition (2011), Burton E TroppJones&BartlettLearning,USA.
10. CellandMolecularBiology:ConceptsandExperiments,6thEdition,Karp,G.2010.; JohnWiley&Sons.Inc.

WebLinks:


1. <https://micro.magnet.fsu.edu/cells/bacteriacell.html>
2. <https://micro.magnet.fsu.edu/cells/virus.html>
3. <https://www.britannica.com/science/virus>
4. https://en.wikipedia.org/wiki/DNA_replication
5. <https://www.biointeractive.org/classroom-resources/central-dogma-and-genetic-medicine>

CO-POMapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1

CO5	3	3	1	3	3	2	1	1	2	1	3	2	1
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	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-I yr Semester-2 Paper- 2	Title of the course “Microbiology, Cell and Molecular Biology ” Course Code :BTL150 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part-A

I. Essay questions: answer any THREE

- Question1 from Unit I
- Question2from Unit II
- Question3 from Unit III
- Question4 from Unit IV
- Question5 from Unit V
- Question6 from additional input


Part-B

II. Short answer questions: answer any FOUR

4 X 5= 20

M Each answer carries FIVE marks.

- Question7:fromUnit I
- Question8:fromUnit I
- Question9:fromUnit II
- Question10:fromUnit II
- Question11:fromUnit III
- Question12:fromUnit III
- Question13:fromUnit IV
- Question14:fromUnit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-I yr Semester-2 Paper- 2	Title of the course “Microbiology, Cell and Molecular Biology” Course Code– BTL150 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

PART-A

I. Answer any THREE questions. (Each answer carries TEN marks). 3X 10=30M

1. Give the ultra-structure of Bacteria with neat labeled diagram
2. Explain the cell cycle and cell division
3. Explain the process of transcription in eukaryotes
4. What is replication and explain the process of replication in *E.coli*
5. Write a note on post-translational modifications in prokaryotes
6. Role of antibiotics in regulation of Gene expression

PART-B

II. Answer any FOUR questions.(Each answer carries FIVE marks.) 4X5= 20M

7. Contributions of Leeuwenhoek
8. Simple staining
9. General characteristics of virus
10. Mitochondria
11. SOS repair
12. Bacteria growth curve
13. Capping
14. Ribosomes



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper -2	Subject : Biotechnology	Program : B.Sc.			
	Title of Course “ Microbiology, Cell and Molecular Biology”-Lab	Group : BBC			
	Course Code: BTL150P	Year -1			
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Handling of pipettes. Preparation of Solutions Handling of analytical instruments.	0	0	2	1

Objectives:

1. The students should be able to understand the principle behind the tests.
2. The students should be able to understand the concept behind the microbiological work.

List of Experiments/Syllabus:

1. Cleaning and preparation of glassware Sterilization techniques (autoclave, hot air oven, filter)
2. Preparation of nutrient agar medium for bacteria
3. Preparation of PDA medium for fungi
4. Isolation of bacteria from soil (serial dilution)
5. Isolation of Pure cultures (Streak plate, spread plate and pour plate)
6. Simple staining technique
7. Differential staining technique
8. Study of stages of mitotic cell division
9. Study of stages of meiotic cell division
10. Extraction and isolation of DNA from bacteria.


Reference books:

1. David A. Thompson. 2011. Cell and Molecular Biology Lab. Manual.
2. P. Gunasekaran. 2007. Laboratory Manual in Microbiology. New Age International

Virtual Lab Links:

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://www.labster.com/blog/popular-microbiology-virtual-lab-simulations/>

	Government College (Autonomous) Rajahmundry Department Of Biotechnology			
	Subject : Biotechnology		Group : BBC	
B.Sc.-Iyr Semester-2 Paper- 2	Title of the course “ Microbiology, Cell and Molecular Biology - Lab ” Course code: BTL150P Semester End Exam (2022-23)			
Time : 3Hrs	Practical - Model Question Paper		Credits : 1	Marks : 50

1. Write protocol for isolation of bacteria from soil and carryout the experiment 15M
 2. Write principle and protocol of simple staining and perform the Experiment 10M
 3. Identify givens potters 15M
 4. Record 5M
 5. Viva-Voce 5M
-
- TOTAL: 50M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Syllabus Paper - 3	Subject : Biotechnology	Program : B.Sc Group : BBC Year- II Semester : 3			
	Title of the Course “ Immunology and rDNA Technology ” Course Code: BTL151				
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lecture	T Tutorial	P Practical	C Credits
Pre-requisites:	<ul style="list-style-type: none"> ➤ Knowledge of organs of human system. ➤ Types of cells in the human body. ➤ Immunity and resistance in general 	4	2	-	4

Course Objectives:

1. The students should be able to describe the roles of the immune system in both maintaining health and contributing to disease.
2. The students should be able to describe immunological response and how it is triggered and regulated.
3. The students should be able to identify the cellular and molecular basis of immune responsiveness.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	➤ Immunology is a branch of biology that encompasses the study of host defence mechanisms and resistance towards pathogens.
CO2	➤ This course enables the pupil to understand the basics of immune system functioning through study of organs and cells involved in immune response.
CO3	➤ Apart from understanding ⁵² the mounting of immune responses , the pupil will now acknowledge the applications of immunology. in numerous disciplines like medicine, organ transplantation, oncology, rheumatology, virology, bacteriology, parasitology.
CO4	➤ The cutting edge Recombinant DNA technology, which is about bringing together useful genes from across species and producing genetically modified organisms is sure to make the pupil understand the processes involved thoroughly .
CO5	➤ Overall the interesting course design is likely to instil a research tempo in the pupil and ultimately contribute to the welfare of humankind.

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>Databases (PubMed, NCBI, EMBL and ExPASy), nucleotide and protein BLAST analysis, CLustal W and phylogenetic tree construction. Introduction to omics (proteomics, genomics and transcriptomics). Introduction to nanotechnology.</p>	<p>Employability</p>	<p>Live, killed, attenuated, subunit and recombinant vaccines</p> <p>Principles and application of PCR. Southern, Northern and Western Blotting. Introduction to DNA sequencing</p>	<p>Entrepreneurship</p>	<p>Hybridoma technology, Monoclonal antibodies and their application in immunodiagnosis</p> <p>Applications of rDNA technology in agriculture (transgenic plants, edible vaccines and antibodies) and medicine (disease diagnosis and DNA fingerprinting)</p>
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Syllabus : “ Immunology and rDNA Technology ”

UNIT–I : Concepts and Cells of the Immune System:

Antigen, hapten, antibody (types), antigenicity Versus immunogenicity ., Innate and adaptive immunity. Basic concepts of humoral and cell-mediated immune response.

Additional input : Blood group antigens , Bombay blood group

Unit II : Organs and mediators of Immune system

Hematopoiesis , organs, tissues, cells and mediators of the immune system (primary and secondary lymphoid organs, lymphocytes and cytokines).Introduction to complement components, MHC.

Additional Input : Immune boosting diet., Transplant rejection.

Unit–III : Vaccinology and Clinical Immunology:

Live, killed, attenuated, subunit and recombinant vaccines. Role and properties of adjuvants. Hybridoma technology, Monoclonal antibodies and their application in immunodiagnosis. Antigen and antibody interactions -precipitation, agglutination, immune diffusion and ELISA. Introduction to hypersensitivity and autoimmunity.

Additional Input : Natural remedies for Hypersensitivity and Autoimmunity.

Unit–IV : Introduction, Tools and Techniques of rDNA Technology:

Introduction to rDNA technology, steps involved in cloning, tools of genetic engineering (Genes, Cloning vectors - plasmids and cosmids, Enzymes – restriction endonucleases and DNA Ligase, Hosts – bacteria and yeast). Principles and application of PCR. Southern, Northern and Western Blotting. Introduction to DNA sequencing (Sanger Sequencing) and .

Unit – V :Cloning Strategies and Application of rDNA Technology:

cDNA library construction : Methods of transformation, recombinant selection and screening methods. Applications of rDNA technology in agriculture and medicine (transgenic plants, and antibodies) .

Additional Input and Assignment			
unit no:	Additional input	Definition	Justification
1	Blood group antigens and Bombay blood group	Terminology	It is important to know about blood group antigens for safe blood transfusion
2	Transplant rejection, Immune boosting diet.		
3	edible vaccines, Natural remedies for Hypersensitivity and Autoimmunity		Very important in present lifestyle
4	Site-directed Mutagenesis		
5	Recombinant insulin		Very useful knowledge

Textbooks:

1. Textbook of basic and clinical immunology, 1st edition (2013), SudhaGangal and ShubhangiSontakke, University Press, India
2. Immuno diagnostics, 1996, By S.C. Rastogi, Publ: New Age
3. Introduction to Immunology- 2002, C. V. Rao- Narosa Publishing House
4. Textbook of Biotechnology - 2007, By H.K. Das (Wiley Publications)
5. Molecular Biology & Biotechnology- 1996, By H.D. Kumar, Publ: Vikas
6. Introduction to Bioinformatics – 2007, By V. Kotheekar.

Referencebooks:

- . Kuby immunology, Judy Owen, Jenni Punt, Sharon Stranford., 7th edition (2012), Freeman and Co., NY
1. Immunology, 7th edition (2006), David Male, Jonathan Brostoff, David Roth, IvanRoitt, Mosby, USA.
 2. Principles of Gene Manipulation - 7 th edition, 2006, By R.W. Old & S.B. Primrose, Publ: Blackwell
 3. Molecular Biotechnology - 4 th edition, 2010, G.R. Click and J.J. Pasternak, Publ:Panima
 4. Genes and Genomes – 1991, By Maxine Singer and Paul Berg
 5. Genes VII- 2000, By B. Lewin - Oxford Univ. Press
 6. Molecular Biology - 4 th Edition, 2008, By D. Freifelder, Publ: NarosaPublishinghouse New York, Delhi
 7. Brown TA. (2006). Gene Cloning and DNA Analysis. 5th edition. BlackwellPublishing, Oxford, U.K. 14.Clark DP and Pazdernik NJ. (2009). Biotechnology-Appling the Genetic Revolution. Elsevier Academic Press, USA.
 8. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles andApplications of recombinant DNA. ASM Press, Washington
 9. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation andGenomics, 7 thedition. Blackwell Publishing, Oxford, U.K.
 10. Introduction to Bioinformatics – 2013, By Arthur M. Lesk
 11. Bioinformatics: 2001, Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press
- Biological Sequence Analysis: 1 st Edition, 1998, Probabilistic Models of Proteins and Nucleic Acids by Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison, Cambridge University Press.

WebLinks:

1. Bioinformatics tools and Resources – free online tools, software

CO-POMapping:


(1:Slight[Low];

2:Moderate[Medium];

3:Substantial[High], 4:No Correlation

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1

CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-II yr Semester-3 Paper- 3	Title of Course “ Immunology and rDNA Technology ” Course Code :BTL124 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

I. Essay questions: answer any THREE **3 X 10 = 30 M**

Each answer carries TEN marks.


- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions: answer any FOUR **4 X 5= 20 M**

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 12: from Unit III
- Question 13: from Unit IV
- Question 14: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-II yr Semester-3 Paper- 3	Title of Course “ Immunology and rDNA Technology ” Course Code : BTL124 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

Biotechn

Part –

A

Answer any THREE questions. Each carries TEN marks.

3 X 10= 30M

1. Explain the different cells of immune system (I)
2. What is various organs of the immune system? (II)
3. Write about steps involved in Hybridoma Technology (III)
4. Write about principle and applications of Blotting techniques. (IV)
5. Write the applications of r-DNA technology in agricultural field (V)
6. Write an essay on production of recombinant insulin . (Additional input)

PART-B

Answer any FOUR questions. Each carries FIVE marks.

5 X4 = 20 M

7. Antibody (I)
8. Humoral immunity. (I)
9. MHC (II)
10. Hematopoiesis (II)
11. Precipitation (III)
12. Recombinant vaccine (III)
13. Sanger Sequencing (III)
14. Principle of PCR (III)
15. Cosmids (IV)
16. Edible vaccines (V)



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-3	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Immunology and rDNA Technology ”-Lab Course Code: BTL124P	Group : BBC			
	Total Hours – 30hrs ; Per Week -2hrs	Year-II Semester : 3			
		L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Handling of pipettes. Preparation of Solutions Handling and Disposal of bio hazardous material	0	0	2	1

Objectives:

1. The students should be able to understand the principle behind the assays.
2. The students should be able to understand the concept behind the diagnostic tests.
3. The students should be able to interpret the result obtained after performing the assay

List of Experiments/Syllabus:

1. Determination of Blood Groups
2. Pregnancy test
3. Widal test
4. Ouchterlonyimmunodiffusion
5. Radial immune diffusion
6. ELISA
7. Production of antibodies (theory exercise)
8. Bleeding, separation of serum and storage
9. Lymphoid organs (theory exercise)
10. Isolation of plasmid DNA (alkaline lysis method)
11. Analysis of plasmid DNA by Agarose gel electrophoresis
12. Southern blotting (theory exercise)
13. PCR Amplification

Referencebooks:

1. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press.

2. Bioinformatics: 2004, A Practical Guide to the Analysis of Genes and Proteins, Andreas D. Baxevanis, B. F. Francis Ouellette, Wiley-Interscience

Weblinks

<https://www.yourgenome.org/facts/what-is-gene-expression>

<https://microbenotes.com/gene-expression/>

https://en.wikipedia.org/wiki/Gene_expression

<https://microbenotes.com/recombinant-dna-technology-steps-applications-and-limitations/>

<https://www.biotechnologynotes.com/recombinant-dna-technology/recombinant-dna-technology-notes/259>

virtual lab links

<https://ocw.mit.edu/courses/biology/7-01sc-fundamentals-of-biology-fall-2011/recombinant-dna/>

<https://www.coursera.org/lecture/genes/gene-expression-Ob3FQ>



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

**B.Sc.-II yr
Semester-3
Paper- 3**

**Title of Course
“ Immunology and r DNA technology ”
Course code: BTL124P**

Semester End Exam (2022-23)

Time : 3Hrs

Practical - Model Question Paper

Credits : 1

Marks : 50

1. Major

20 M

Isolate the plasmid DNA from given bacterial culture and perform agarose gel electrophoresis?

2. Minor

10M

Determine the blood group of the given blood sample ?

3. Spotters (5x2)

10 M

a) Lymphoid organs

b) Cosmids

c) ELISA

d) BLAST

e) RIA

4. Record

05M

5. Viva-voce

05M

Total =

50M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 4	Subject : Biotechnology	Program : B.Sc Group : BBC Year -II Semester : 4			
	Title of the Course “ Plant and Animal Biotechnology ” Course Code: BTL152				
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lecture	T Tutorial	P Practical	C Credits
Pre-requisites:	<ul style="list-style-type: none"> ➤ Knowledge about plant and animal physiology. ➤ Knowledge about structure and functions of both plant and animal cells. 	4	1	-	4

Course Objectives:

- The student should be able to understand the basic mechanisms in animal and plant cells
- The students should be able to recognize special features of plant and animal cells.
- The student should be able to understand the applications of plant and animal for welfare of humankind and environment altogether.

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	Plant biotechnology encompasses and enables the pupil to understand tissue culture techniques and various applications like production and propagation of hybrids which are of superior quality.
CO2	Animal biotechnology encompasses the growing of animal cells <i>invitro</i> and its study enables in understanding the secrets of life and the requirements & mechanisms of genetic corrections
CO3	The course provides thorough understanding of techniques involved in making the life of human kind easier.
CO4	This very interesting course not only encourages the pupil to further go for higher studies but also induces a quest to learn more and more and also to pursue research
CO5	The pupil will understand nutritional requirements of plants and animal cells, which enables the student to grow the cells on artificial medium invitro. Also the course confers understanding and application of cellular mechanisms to produce industrially important products.

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>media preparation</p> <p>sterilization techniques</p> <p>Agrobacterium mediated Gene transfer</p> <p>Animal cell culture</p> <p>Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications</p>	<p>Employability</p>	<p>establishment of cultures</p> <p>Cryopreservation</p> <p>Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications. Tests: cell viability and cytotoxicity</p>	<p>Entrepreneurship</p> <p>applications of tissue culture</p> <p>Plant secondary metabolites</p> <p>Transgenic plants as bioreactors</p> <p>Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines), IVF, Concept of Gene therapy, Concept of transgenic animals –</p> <p>Bio safety-introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GLP, GMP, Introduction to IP- Types of IP: patents, trademarks & copyright</p>
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Syllabus: **Plant and Animal Biotechnology**

UNIT-I : **Plant tissue culture techniques & secondary metabolites production:**

Plant tissue culture : Totipotency, media preparation – nutrients and plant hormones; sterilization techniques; establishment of cultures – callus culture, cell suspension culture ,applications of tissue culture-micro propagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization - applications. Cryopreservation, Plant secondary metabolites-concept and their importance.

UNIT II: **Transgenesis and Molecular markers:**

Plant transformation technology-- Agrobacterium mediated Gene transfer (Ti plasmid), , Transgenic plants as bioreactors. Herbicide resistance – glyphosate, Insect resistance- Bt cotton, Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.

UNIT III: Animal tissue culture techniques: Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture, cell lines, stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

UNIT IV: **Transgenic animals & Gene Therapy:**

Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines),IVF, Concept of Gene therapy, Concept of transgenic animals – Merits and demerits -

UNIT V: **Bioethics, Biosafety and IPR:**

Bioethics in cloning and stem cell research, Human and animal experimentation, animal rights/welfare. Bio safety-introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GLP, GMP, Introduction to IP-Types of IP: patents, trademarks & copyright

Additional Input and Assignment			
unit no:	Additional Input	Deletion	Justification
1	Multipotent Vs Totipotent		
2	Hairy root features of Ri plasmid		
3	Advantages of tissue culture, 3-D bioprinting		
4	Ethical issues in animal biotechnology.		
5	Infringment (IPR)		

Textbooks:

Recommended Books :

1. Introduction to Plant Tissue Culture..M.K. Razdan ,2003,Science Publishers
2. Plant Tissue Culture, kalyan Kumar De,199 M7, New Central Book Agency
3. Biotechnology – By U. Satyanarayana ;1997
4. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects By Y.P.S. Bajaj and A. Reinhard ,2001
5. Introduction to Plant Tissue Culture, M. K. Razdan, 2003,Science Publishers
6. A Textbook of Biotechnology,R C Dubey,S. 2014,Chand Publishing
7. Elements of Biotechnology,P. K. Gupta, 1994,Rastogi Publications
8. M.M. Ranga, Animal Biotechnology; Agrobios (India) ,2006.

Referencebooks:

- ✓ Daniel R. Marshak, Richard L. Gardner, David Gottlieb “Stem cell Biology” edited by Daniel 2001,Cold Spring Harbour Laboratory press, New York

Weblinks

1. <https://www.helpforag.app/2018/03/biotechnology.html>
2. <http://velhightech.com/wp-content/uploads/2019/04/BT-6010-Plant-Biotechnology.pdf>
3. <https://nifa.usda.gov/plant-biotechnology>


Virtual lab Links

1. https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC108J-lab-manual.pdf
2. <https://www.onlinebiologynotes.com/equipment-and-materials-used-in-animal-cell-culture/>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], 4:No Correlation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	1	3	3	2	3	3	1
CO2	3	1	1	2	3	2	2	3	3	2	2	4	1
CO3	3	3	1	1	2	2	2	3	3	2	3	3	3
CO4	3	3	1	1	2	2	2	3	3	2	2	2	2
CO5	3	3	1	1	1	2	1	1	1	2	3	3	3

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IYr Semester-4 Paper- 4	Title of Course “ Plant and Animal Biotechnology ” Course Code :BTL123 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

I. Essay questions: answer any THREE

3 X 10 = 30 M

Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input


Part-B

II. Short answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 12: from Unit III
- Question 13: from Unit IV
- Question 14: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-Ilyr Semester-4 Paper- 4	Title of Course “ Plant and Animal Biotechnology ” Course Code : BTL123 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

PART –A

ANSWER any three questions. Each answer carries ten marks 3X10=30 marks

1. What are metabolites and explain different plant secondary metabolites (Unit 1)
2. What are transgenic plants? Write a note on transgenic plants as bioreactors (Unit 2)
3. What are cell cultures and explain different types of cell cultures (Unit 3)
4. Write a note on transgenic animals with merits and demerits (Unit 4)
5. Explain about biosafety and different levels in biosafety (Unit 5)
6. Write an essay on advantages of tissue culture techniques (Additional input)

PART –B

Answer any FOUR questions. Each answer carries Five marks. 4x5 =20 Marks

- 7.. Micro propagation
- 8.. Cryopreservation
- 9.. RAPD
10. Ti-Plasmid
11. Somatic embryogenesis
12. Cell lines
13. IVF
14. Animal rights



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-4	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Plant and Animal Biotechnology Lab ”	Group : BBC			
	Course Code: BTL123P	Year-II			
	Total Hours – 30hrs ; Per Week -2hrs	Semester : 4			
Pre-requisites:	➤ Aseptic techniques. ➤ Preparation and sterilization of solutions.	L Lect ures	T Tuto rial	P Practical	C Credits
		0	0	2	1

Objectives:

- To induce logical thinking with respect to understanding nutritional requirements of plants and animal cells.
- To enable the student to grow the cells on artificial medium invitro.
- To extrapolate and apply the cellular mechanisms to produce industrially important products.

List of Practical Experiments/Syllabus:

- Plant culture media and composition of MS media
- Raising of aseptic seedlings
- Induction of callus from different explants, cytology of callus
- Plant propagation through Tissue culture (shoot tip and Nodal culture)
- Establishing a plant cell culture (both in solid and liquid media)
- Suspension cell culture
- Cell count by hemocytometer.
- Establishing primary cell culture of chicken embryo fibroblasts.
- Animal tissue culture – maintenance of established cell lines.
- Animal tissue culture – virus cultivation.
- Estimation of cell viability by dye exclusion (Trypan blue).

Referencebooks:

1. R. Ian Freshney, “Culture of animal cells – A manual of basic techniques” 4th edition, John Wiley & Sons, 2000, Inc, publication, New York.
2. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan, 1998.

Weblinks

1. <https://www.helpforag.app/2018/03/biotechnology.html>.
2. <http://velhightech.com/wp-content/uploads/2019/04/BT-6010-Plant-Biotechnology.pdf>
3. <https://nifa.usda.gov/plant-biotechnology>.
4. <https://velhightech.com/wp-content/uploads/2019/04/BT-6007-Animal-Biotechnology.pdf>



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

Major Question

**B.Sc.-Ilyr
Semester-4
Paper- 4**

**Title of Course
“ Plant and Animal Biotechnology Lab ”
Course code: BTL123P**

Semester End Exam (2022-23)

Time : 3Hrs

Practical - Model Question Paper

Credits : 1

Marks : 50

1. Use the given explant sample to induce callus and write the protocol and procedure of the experiment?
20M

Minor Question

2. Determine the number of cells in given sample using haemocytometer 10M

3. Spotters 2 x 5 = 10M

a) RFLP

b) Bt-Cotton

c) Bioreactor

d) Plasmid

e) Chick embryo fibroblast

4. Record 5M

5. Viva 5M

Total = 50 M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 5	Subject : Biotechnology	Program : B. Sc			
	Title of the Course “ Environment and Industrial Biotechnology” Course Code: BTL153	Group : BBC Year -II Semester : 4			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lect ure	T Tutori al	P Pract ical	C Credits
Pre-requisites:	<ul style="list-style-type: none"> ➤ Various Causes of Environmental pollution ➤ Knowledge about General features of microbes 	4	1	-	4

Course Objectives:

1. To understand the pollution effect caused by industrialization.
2. To understand the environmental pollution caused by technology.
3. To understand the importance of microbes and their products.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	The pupil will understand the pollution effect caused by industrialization
CO2	The pupil will be able to understand, design and solve the environmental pollution through Green technology Approach.
CO3	The pupil will understand the importance of microbes and their products
CO4	The pupil will be able to understand the requirements for commercial production of industrially important microbial products
CO5	The pupil will be able to contribute to development of industrialisation while still protecting the environment.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development	<p>Measurement of water pollution, sources of water pollution. Microbiology of waste water treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors. Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors. microbial groups involved in biogas production & interactions, factors affecting biogas production, Industrially important microbes, its screening, selection and identification</p>	Employability	<p>air pollution & its control through Biotechnology, Biofilters, Bioscrubbers, Biotrickling filter. Bioremediation of Hydrocarbons and its applications Degradation of pesticides and other toxic chemicals by microorganism</p> <p>Maintenance and preservation of industrially important microbial cultures.</p> <p>Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid And Lysine</p>	Entrepreneurship	<p>Role of genetically Engineered microbes, Concept of Phytoremediation, environmental safety guidelines</p> <p>Biofertilizers, Vermiculture.</p> <p>Strain Improvement, Basic concepts of fermentation; Design of fermenter and applications.</p> <p>dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Pencillin)</p>
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Syllabus: “ Environment and Industrial Biotechnology”

UNIT I: Pollution Types and Control:

Environmental Biotechnology-Environmental Pollution: Types of pollution, air pollution & its control through Biotechnology, Biofilters, Bioscrubbers, Biotrickling filter.

Water pollution and its management:, sources of water pollution. Microbiology of waste water treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors.

Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.

UNIT II: Bioremediation:

Biodegradation and Bioremediation: Concepts & principles of Bioremediation, Bioremediation of Hydrocarbons and its applications Degradation of pesticides and other toxic chemicals by microorganism. Role of genetically Engineered microbes, Concept of Phytoremediation, environmental safety guidelines.

UNIT III: Biofuels:

Biofuels-biogas, microbial groups involved in biogas production & interactions, factors affecting biogas production, Biofertilizers,.

UNIT IV: Basic principles of Microbial technology:

Industrially important microbes, its screening, selection and identification. Maintenance and preservation of industrially important microbial cultures. Strain Improvement, Basic concepts of fermentation;

UNIT V: Commercial Production of Microbial products:

Microbial technology products and applications; Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid and Lysine). Fermentation by microbes for food additives: dairy products (Cheese, Yogurt), beverages (Beer, Wine)

Additional Input and Assignment			
unit no:	Additional Input	Deletion	Justification
1	Measurement of water pollution		
2	Biodegradable products		
3	Vermiculture		
4	Design of fermenter and applications.		
5	Microbial production of antibiotics (Streptomycin, Pencillin).		

Textbooks:

1. K. Vijaya Ramesh, Environmental Microbiology, 2004, MJP Publishers, Chennai.
2. A.G. Murugesan, C. Raja Kumari, Environmental Science & Biotechnology - Theory & Techniques, 2005, MJP Publishers.

Introduction to Environmental Sciences, Y. Anjaneyulu, 2004, BS Publications

3. Industrial Microbiology by A.H. Patel, 2009

Referencebooks:

1. Environmental microbiology by Raina M. Maier, Ian L. Pepper & Charles P. Gerba, 2000, Academic press.
2. Environmental Chemistry, A.K. De. Wiley Eastern Ltd., 2001, New Delhi
3. Introduction of Biodeterioration, D. Allsopp and K.J. Seal, ELBS/Edward Arnold, 2008
4. Power un seen: How microbes rule the world. By Dixon, B. Freeman/ Spectrum, 1994, Oxford.
5. Environmental Microbiology. By. Mitchell. R. Wiley, 1992, New York
6. Prescott & Dum (2002) Industrial Microbiology, Agrabiros (India), 2005, Publishers
7. Creueger W. & Crueger A. A Text of Industrial Microbiology, 2000, 2nd Edition, Panima Publishers corp.

Weblinks

1. https://www.brainkart.com/subject/Environmental-Biotechnology_242/
2. <https://www.biotechnologynotes.com/environment/environmental-biotechnology-with-meaning/735>
3. https://issuu.com/brainkart.com/docs/environmental_biotechnology
4. <https://www.edx.org/learn/biotechnology>

Virtual lab links


1. <https://www.epfl.ch/labs/lbe/>
2. <https://www.srmist.edu.in/engineering/department-of-biotechnology/environmental>

CO-POMapping:

(1:Slight[Low];2:Moderate[Medium];3:Substantial[High], :No Correlation)

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

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-Ilyr Semester-4 Paper- 5	Title of Course “Environment and Industrial Biotechnology ” Course Code :BTL153 Semester End Exam (2022-23) Max.Marks: 50	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

I. Essay questions: answer any THREE

3 X 10 = 30

M Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input


Part-B

II. Short answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 12: from Unit III
- Question 13: from Unit IV
- Question 14: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIyr Semester-4 Paper- 5	Title of Course . “Environment and Industrial Biotechnology” Course Code : BTL153 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

PART –A

Answer any THREE questions. Each answer carries TEN marks.

3x10=30 Marks

1. Explain the microbiology of waste water treatment (Unit 1)
2. Write about role of genetically engineered microbes (Unit 2)
3. Write about biogas production (Unit 3)
4. Explain about preservation of industrial microbial cultures (Unit 4)
5. Explain about microbial production of organic acids (Unit 5)
6. Write an essay on biodegradable products (Additional input)

PART –B

Answer any FOUR questions. Each answer carries Five marks.

4x5 =20 Marks

7. Air pollution
8. Oxidation ponds
9. Hydro carbons applications
10. Phytoremediation
11. Biofertilizers
12. Vermiculture
13. Fermenter applications
14. Streptomycin



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-5	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Environment and Industrial Biotechnology ”-Lab Course Code: BTL153P	Group : BBC Year-II Semester : 4			
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Volumetric Titrations Knowledge about handling and growing microbes .	0	0	2	1

Objectives:

1. To understand the biological and chemical content of water.
2. To understand the standard test used to determine the pollution level in water.
3. To understand the exploitation of microbes to produce industrially important quality products.

List of Experiments/Syllabus:

1. Detection of coliforms for determination of the purity of potable water.
2. Determination of total dissolved solids of water
3. Determination of Hardness and alkalinity of water sample.
4. Determination of dissolved oxygen concentration of water sample
5. Determination of biological oxygen demand of sewage sample
6. Determination of chemical oxygen demand (COD) of sewage sample.
7. Isolation of industrially important microorganisms from soil.
8. Isolation of amylase producing organisms from soil.
9. Production of α – amylase from Bacillus Spp. by shake flask culture.
10. Production of alcohol or wine using different substrates.
11. Production of citric acid by submerged fermentation
12. Estimation of citric acid by titrimetry.



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

**B.Sc.-Ilyr
Semester-4
Paper- 5**

**Title of Course
“ Environmental and Industrial Biotechnology ”
Course code: BTL153P
Semester End Exam (2022-23)**

Time : 3Hrs

Practical - Model Question Paper

Credits : 1

Marks : 50

- | | | |
|---|------|----|
| 1. Determine the BOD of given water sample | 15 M | |
| 2. Determination the hardness of given water sample | 10M | |
| 3. Spotters | 15M | |
| a) Fermenter | | |
| b) Principle of wine preparation | | |
| c) Identify given product from the spotter | | |
| d) Biodegradation principle | | |
| e) Identify structure of amino acid | | |
| 4. Record | | 5M |
| 5. Viva | | 5M |

50M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 6A	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Biostatistics, Bioinformatics and IPR ” Course Code: BTL154	Group : BBC			
	Total Hours Allocated -45 ; Per Week – 3 hrs	Year -III			
		L Lecture	T Tutorial	P Practical	C Credits
Pre-requisites:	➤ Good Quantitative skills	4	1	-	4

➤ **Course Objectives:**

To advance statistical science and its application to problem of human health and disease, with the ultimate goal of advancing the public’s health.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Describe the roles biostatistics serves in the discipline of public health .
CO2	Apply basic statistical concepts commonly used in public health and health sciences. Demonstrate basic analytical techniques to generate results.
CO3	Interpret results of commonly used statistical analyses in written summaries. Demonstrate statistical reasoning skills accurately and contextually
CO4	To understand the application of Computer knowledge on Biology
CO5	To know the mechanism of protecting the innovations .

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development	Collection, Classification and Tabulation of data, Normal distribution and their application to biology	Employability	Concept of sampling and sampling distribution Simple regression and correlation. Concept of analysis of variance (one-way classification	Entrepreneurship	Introduction to Intellectual property Introduction to copyright Importance of intellectual property rights.
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Syllabus: “ Biostatistics, Bioinformatics and IPR ”

Unit I : Introduction to Biostatistics

Collection, Classification and Tabulation of data, bar diagrams and Pie diagrams, Histogram, Mean, median, mode, Standard deviation.

Unit II: Probability:

Concept of probability, basic laws ,. Concept of probability distribution. Binomial and Poisson distributions, Normal distribution and their application to biology.

Unit III:

Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of t-test statistics to biological problems/data: Chi-square, statistic applications in biology.
Simple regression and correlation.

Unit IV: Introduction to Bioinformatics

Biological Databases – Introduction to Biological Databases, their utilization in Biotechnology (NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTPP).
Storage of biological data in databanks, data retrieval from databases and their utilization . Searching sequence databases using BLAST.

Unit V: Introduction to Intellectual property

Introduction to Intellectual property: Types of IP-Introduction to copyrights, patent law, trade mark, (any other type of intellectual property), international organizations, agencies and treaties. Importance of intellectual property rights.


Additional Input and Assignment			
unit no:	Additional Input	Deletion	Justification
1	Frequency curve and frequency polygon		
2	Application of probability to Mendelian segregation		
2	Simple regression and correlation.		
3	Concept of analysis of variance (one-way classification).		
4	Similarity measures - Euclidean, Mahalanobis distance, Edit distance, similarity matrices (PAM, BLOSUM) Multiple sequence alignment – progressive alignment – profiles – multidimensional dynamic programming.		
5	Infringement – Overuse or Misuse of		

References

1. Fundamentals of Biostatistics by Khan and Khanum, Ukaaz Publishers
2. A text book of Bioinformatics by Sharma, Munjal, Shankar
3. Elements of Biotechnology by PK.Gupta.
4. Dutta, N. K. (2004). Fundamentals of Biostatistics, Kanishka Publishers.
5. Gurumani N. (2005) . An Introduction to Biostatistics, MJP Publishers.
6. Daniel, W. W. (2007). Biostatistics- A Foundation for Analysis in the Health Sciences, Wiley.
7. Rao, K. V. (2007). Biostatistics – A Manual of Statistical Methods for use in Health Nutrition and Anthropology.
8. Pagano, M.& Gauvreau, K. (2007). Principles of Biostatistics.
9. Rohatgi, V.K.& Saleh, A.K.Md. (2001). An Introduction to Probability and Statistics, John Wiley & Sons.
10. Sundaram, K.R.(2010) Medical Statistics-Principles & Methods, BI Publications, New Delhi

Weblinks

1. <https://www.yourgenome.org/facts/what-is-gene-expression>
2. <https://microbenotes.com/gene-expression/>

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semster-5 / 6 Paper- 6A	Title of Course “ Biostatistics, Bioinformatics and IPR ” Course Code :BTL154 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

III.

Essay

questions: answer any THREE

3 X 10 = 30

M Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

IV.

Short

answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 12: from Unit III
- Question 13: from Unit IV
- Question 14: from Unit V



Government College (Autonomous) Rajahmundry
Department Of Biotechnology

Subject : Biotechnology

Group : BBC

B.Sc.-Ilyr
Semester-5/6
Paper- 6A

Title of Course .
“ Biostatistics, Bioinformatics and IPR ”
Course Code : BTL153
Semester End Exam (2022-23)

Time : 2 1/2 Hrs

Model Question Paper

Marks : 50

Part – A

I. Essay questions: answer any THREE
Each answer carries TEN marks.

3 X 10 = 30 M

1. Define Mean, Median, Mode and Standard Deviation , Calculate the S.D. for the Following data.(I)
2. Write in detail about probability and probability distributions. (II)
3. Write in detail about application of t – test statistics to biological problems (III)
4. Write an essay on biological databases. (IV)
5. Write an essay on types and importance of intellectual property rights. (V)
6. Write an essay on overuse and misuse of IPR. (Additional Input)

Part -B

Answer all FIVE of the following.

4X5=20M

7. Calculate the mean for individual series 9, 7, 6, 10, 12, 11. (I)
8. On tossing a coin , what is the probability of getting heads . (II)
9. In F₂ generation, Mendel obtained 621 tall plants and 187 dwarf plants out of the total of 808. Test whether these two types of plants are in accordance with the Mendelian monohybrid ratio 3:1 or do they deviate from this ratio. (III)
10. HTML (IV)
11. Write about trade mark. (V)
12. Paper setter's choice
13. Paper setter's choice
14. Paper setter's choice



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-6A	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Biostatistics, bioinformatics, IPR”-Lab Course Code: BTL154	Group : BBC Year-III Semster : 5 / 6			
	Total Hours – 30hrs ; Per Week -2hrs	L Lectur es	T Tuto rial	P Practical	C Credits
Pre-requisites:	Basic computer Knowledge Analytical skills	0	0	2	1

Objectives :

List of Experiments/Syllabus:

- Calculation of Mean of given data
- Draw pie chart of the following data
- Align the given sequences and calculate genetic similarity of the sequences
- Calculate median and mode of the following given data
- Arrange the given data in continuous and discrete form
- Calculate standard deviation of the given following data
- Identify the sequence of the given gene through blast
- Align the sequences using multiple alignment tool.
- Write the complete procedure for obtaining a Patent

Reference books: Khan and Khanum

Virtual Lab Links:



Government College (Autonomous) Rajahmundry

Department Of Biotechnology

Subject : Biotechnology

Group : BBC

**B.Sc.-IIIyr
Semester-5/6
Paper- 6A**

**Title of Course
“ Biostatistics, bioinformatics, IPR”-Lab ”
Course code: BTL154
Semester End Exam (2022-23)**

Time : 3Hrs

Practical - Model Question Paper

Credits : 1

Marks : 50

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotter (3x5M)	15 M
3. Record	05M
4. Viva-voce	05 M
Total	----- 50 M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 7A	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Classical Genetics , Human Genetics and Biomedical Nanotechnology ” Course Code: BTL200	Group : BBC Year -III Semester : 5 /6			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lect ure	T Tutori al	P Pract ical	C Credits
Pre-requisites:	<ul style="list-style-type: none">➤ Chromosome structure and role of Genes.➤ Inheritance patterns➤ Nanotechnology.	4	1	-	4

➤ Course Objectives:

- To develop and demonstrate an understanding of the structure and function of genes and the organisation of human genome.
- To develop an understanding and skill in the mechanism of inheritance, patterns of inheritance, and Mendelian inheritance in human.
- To impart knowledge on biomedical applications of nanotechnology.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Student will have deeper understanding of the structure and function of genes and the organisation of human genome.
CO2	The student will understand causes of genetic diseases and development of effective treatment and also to understand the genetics of human life.
CO3	Student will develop an understanding and skill with regard to the mechanism of inheritance, patterns of inheritance, and Mendelian inheritance in human.
CO4	The student shall acquire and understand the nano science and its applications and will help them understand broad outline of nanoscience and nanotechnology.
CO5	The student will gain knowledge on biomedical applications of nanotechnology.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development	genetic population studies and Hardy Weinberg Equations.	Employability	Pedigree Analysis Mutations and instability of human DNA (From pedigree to molecular pathology)	Entrepreneurship	Quantum dot technology: early diagnosis of cancer, and other applications of quantum dots
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Syllabus: “ Classical Genetics , Human Genetics and Biomedical Nanotechnology”

Unit I : Classical Genetics

Mendel Laws and Deviations- Incomplete dominance and Co dominance, Penetration and pleiotropic, Recessive and Dominant episstatic gene interaction,

Unit II : Classical Genetics

Structure of gene, gene and environment, gene copies and heterogeneity, Meiotic non disjunction of chromosomes, chromosome abnormalities in plants, Linkage, recombination, genemaps, interference and coincidence, Sex determination,

Unit III : Human Molecular Genetics

Classical Vs contemporary Central Dogma of molecular biology, **Chromosome** – structure -function relationship , chromosome abnormalities in humans, Pedigree Analysis & complications in Mendelian Pedigree patterns, DNA Cloning and Hybridization Techniques.

Unit IV : Biomedical Nanotechnology :

Introduction, Applications of micro and Nano-electromechanical devices to drug delivery, Photo dynamic therapy in targeted drug administration, Biosensors and their applications in modern medicine.,

Unit V: Biomaterials sciences:

Introduction to biomaterials, biomaterials in Tissue engineering, nanotechnology . Nano materials for drug delivery & other applications of materials in medicine. Toxic Mechanisms & environmental implications of nanoparticles,

Additional Input and Assignment			
unit no:	Additional Input	Deletion	Justification
1	Concept of multiple alleles		
2	Genetic population studies and HardyWeinberg Equations.		
3	Animal Models for Human Diseases, Disease Gene Discovery, The Hap Map Project		
4	Quantum dot technology: early diagnosis of cancer, and other applications of quantum dots		
5	Plant and microbes as Nanofactories		

References:

1. Nano biotechnology by SubbiahBalaji, MJP Publishers.

2. Hand book of Materials for Nano medicine by Torchilin V, PAN STANFORD publishers
3. Nanotechnology for biomedical applications by Thomas Varghese

Weblink

1. <https://www.understandingnano.com/medicine.html>
2. http://cfl.iums.ac.ir/uploads/my_nano_ref.pdf


Virtual links

1. <https://teach.its.uiowa.edu/remote-and-virtual-labs-online-nanotechnology-course>
2. https://www.teachengineering.org/lessons/view/van_nanoparticles_lesson03

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-I yr Semester-5/6 Paper- 7A	Title of Course “ Classical Genetics, Human Genetics and Biomedical Nanotechnology ” Course Code :BTL200 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

V.Essay questions: answer any THREE

3 X 10 = 30

M Each answer carries TEN marks.

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

VI.


Short

answer questions: answer any FOUR

4 X 5= 20 M

Each answer carries FIVE marks.

- Question 7: from Unit I
- Question 8: from Unit I
- Question 9: from Unit II
- Question 10: from Unit II
- Question 11: from Unit III
- Question 12: from Unit III
- Question 13: from Unit IV
- Question 14: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 7A	Title of Course “ Classical Genetics , Human Genetics and Biomedical Nanotechnology ” Course Code : BTL200 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

Part – A

Essay questions: answer any 4

3 X 10 = 30 M

1. Describe Mendel's Laws and deviations (I)
2. Describe the mechanism of Sex determination. (II)
3. Describe chromosome abnormalities in humans (III)
4. Describe the Photodynamic therapy in target therapy (IV)
5. Describe the biomaterials in tissue engineering (V)
6. Describe in detail the Hap Map Project (Additional Input)

Part-B

Answer any 4 questions

4 x 5 = 20 M

7. Pleiotropy
8. Hardy Weingberg
9. Pedigree analysis
10. Quantum dot technology
11. Microbes as Nanofactories
12. Paper setter's choice
13. Paper setter's choice
14. Paper setter's choice



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-7A	Subject : Biotechnology	Program : B.Sc			
	Title of Course “Classical Genetics and Human Genetics, Biomedical Nanotechnology ”-Lab Course Code: BTL200	Group : BBC Year-III Semester : 5/6			
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	➤ Basic knowledge about nanoparticles ➤ Handling of nanoparticles	0	0	2	1

Objectives:

1. The students should be able to understand the principle behind the cause of genetic disturbance and repair.
2. The students should be able to understand the concept of inheritance patterns and mechanism to stop the inheritance of lethal genes.
3. To understand the novel treatments for various diseases.

List of experiments:

1. Study of different phases of mitosis in onion root tips and meiosis in *Alliumcepa* flower buds.
2. Karyotyping in *Allium* or *Drosophila*
3. Problems and assignments in Mendelian genetics
4. Isolation of auxotrophic mutants (plants or insects).
5. Mutation of bacteria by UV
6. Chemical induced mutation in bacteria
7. problems related to pedigree analysis, Problems related to Restricted Fragment Length polymorphism and its applications
8. Ultrasonic production of Nano sized dispersion emulsion.
9. Synthesis of copper nanoparticles
10. Synthesis of copper sulphate nanoparticles using ultrasonication
11. Synthesis of copper Nano particles using wet chemical method
12. Synthesis of copper Nano particles using Hibiscus bark by wet chemical method.
13. Synthesis of copper herbal extract nanoparticle using ultrasonication and heat

*** Depending on the availability of chemicals and equipment any 6 of the above practicals Should be performed.**

Referencebooks:

Cell and Molecular Biology – By Roberties&Roberties

Molecular Biology & Biotechnology – By H.D.Kumar

Molecular Biotechnology – By G.R.Glick

Molecular Biology of Gene – By Watson Microbial

Genetics – By S.R.Maloy Molecular Biology – By

David Freifelder Cell and Molecular Biology –

ByS.C.Rastogi

Virtual LabLinks:



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

**B.Sc.-IIIyr
Semester-5/6
Paper- 7A**

**Title of Course
“Classical Genetics and Human Genetics, Biomedical Nanotechnology ”-Lab
Course code: BTL200
Semester End Exam (2022-23)**

Time : 3Hrs

Practical - Model Question Paper

Credits : 1 Marks : 50

- | | |
|--------------------------------------|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotter (3x5M) | 15 M |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |

Total 50 M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 6B	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Organic farming ” Course Code: BTL156	Group : BBC			
	Total Hours Allocated - 60 ; Per Week - 4 hrs	L Lect ure	T Tutori al	P Pract ical	C Credits
Pre-requisites:	➤ Basic knowledge about farming technique and natural products used in farming.	4	1	-	4

Course Objectives:

- This course aims to teach complete knowledge about organic farming.
- This course also teaches about multiple cropping methods

On Completion of the course, the students will be able to-

CO1	The students have basic knowledge of organic farming. Understand the soil profile and nutrients in soil
CO2	The students will be able to understand about eco-friendly farming systems. Appreciate the importance of organic manure and bio fertilizers
CO3	The students will have knowledge about organic nutrient sources and green manures. Produce vermi compost, farmyard manure from bio waste
CO4	The students will be able to know about nutrient management in organic farming. Acquire skill on isolation and maintenance of bio fertilizers.
CO5	The students will have knowledge of multiple cropping.

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>Nutrient management in organic farming. Choice of crops and varieties in organic farming – crop rotations – need and benefits Organic farming – definition – need – scope – principles – characteristics relevance to modern agriculture</p>	<p>Employability</p>	<p>Different eco-friendly farming systems- biological farming, natural farming, regenerative agriculture – permaculture - biodynamic farming</p>	<p>Entrepreneurship</p>	<p>Green manures- bio fertilisers – types, methods of application – benefits and limitations. Nutrient use in organic farming- scope and limitations</p>
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Syllabus:

Unit 1:- Organic farming – definition – need – scope – principles – characteristics relevance to modern agriculture

Unit 2:- Different eco-friendly farming systems- biological farming, natural farming, regenerative agriculture – permaculture - biodynamic farming.

Unit 3:- Organic nutrient sources and their fortification – organic manures- methods of composting

Unit 4:- Green manures- bio fertilisers – types, methods of application – benefits and limitations. Nutrient use in organic farming- scope and limitations.

Unit 5:- Nutrient management in organic farming. Choice of crops and varieties in organic farming – crop rotations – need and benefits

Additional Input: Multiple cropping.

UNIT -1 - Soil: (10h)

Definition, soil formation, composition and characteristics. Types of soils. Distribution of soil groups in India. Acidic, Alkaline and heavy metal contaminated soil. Methods of reclamation. Effects of chemical dependent farming on yield and soil health.

UNIT-2 - Plant Nutrition (10h)

Macro and micro nutrients, functions of nutrients in plant growth and development. Nutrient uptake and utilization by plant. Types of fertilizers. Organic, inorganic and bio fertilizers. Chemical fertilizer. Advantages & disadvantages of their use. Importance of organic and bio fertilizers.

UNIT -3 - Organic Farming (10h)

Definition, concept, benefits. Integrated farming system (combination of organic and inorganic). Mixed farming system. Concept of different cropping systems in relation to organic farming, Inter cropping, crop rotation. Organic farming process. Organic fertilizers, crop nutrients and effective microorganisms in Organic farming.

UNIT- 4 - Organic compost (10h)

Definition, types of compost, farm yard compost, green leaf compost, animal husbandry, animal housing, animal feeding, animal health, breeding goals.

Vermi compost: Introduction, vermi composting material, species of earthworms, small scale, large scale composting process. Vermi castings, harvesting, processing and drying. Nutrient content of vermi compost. Field application methods.

UNIT – 5- Biofertilizers (10h)

Introduction, status and scope. Structure and characteristic features of bacterial bio fertilizers- *Azospirillum*, *Azotobacter*, *Bacillus*, *Pseudomonas*, *Rhizobium* and *Frankia*. Cynobacterial biofertilizers- *Anabaena*, *Nostoc*, *Hapalosiphon* and fungal biofertilizers- AM mycorrhiza and ectomycorrhiza. Mechanism of nitrogen fixation and phosphorus solubilization.

Reference books:

1. Arun K. Sharma. 2002. A Hand book of organic farming. Agrobios, India.627p.
2. Palaniappan, S.P and Annadurai, K.1999. Organic farming-Theory and Practice.Scientific

publishers, Jodhpur, India. 257p.

3. Mukund Joshi and Prabhakarasetty T.K. 2006. Sustainability through organic farming. Kalyani publishers, New Delhi. 349p.

4. Balasubramanian, R., Balakishnan, K and Siva Subramanian, K. 2013.

5. Principles and practices of organic farming. Satish Serial Publishing House. 453p


Weblinks

1. <https://science.umd.edu/classroom/bsci124/lec41.html>
2. <https://www.encyclopedia.com/food/encyclopedias-almanacs-transcripts-and-maps/crop>
3. <https://academic.oup.com/jxb/article/51/342/1/485700>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 6B	Title of Course “ Organic farming ” Course Code :BTL156 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part – A

I. Essay questions: answer any 4 : 4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions : Answer all the 5 Questions 5 X 2 = 10 M

- **Question 7: from Unit I**
- **Question 8: from Unit II**
- **Question 9: from Unit III**
- **Question 10: from Unit IV**
- **Question 11: from Unit V**



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

**B.Sc.-IIIyr
Semester-5/6
Paper- 6B**

Title of Course

“ Organic farming ”

Course Code : BTL156

Semester End Exam (2022-23)

Time : 2 1/2 Hrs

Model Question Paper

Marks : 50

Part – A

Essay questions:

answer any 4

4 X 10 = 40 M

1. Write an essay on principles and characteristics relevance to modern agriculture.
2. Write an essay on different eco-friendly farming systems.
3. Write in detail about methods of composting.
4. Write about nutrients used in organic farming its scope and limitations.
5. Write an essay on crop rotation and its benefits.
6. Write an essay on multiple cropping.

Part- B

Answer all 5 questions

5 x 2 = 10 M

7. Organic farming
8. Regenerative agriculture
9. Fortification
10. Green manures
11. Nutrient management in organic farming.

Time: 3hrs.

SECTION A

(Total: 5 x 5=25Marks)

(Answer any five question, each answer carries ten marks)

- 1) Soil contamination
- 2) Reclamation
- 3) Biofertilizers
- 4) Intercropping
- 5) Animal husbandry
- 6) Vermi casting and harvesting?
- 7) Cyanobacterial biofertilizers

8) Fungal biofertilizers

SECTION B

(Total: 5x10=50Marks)

(Answer any five questions. Each answer carries 10 marks)

9) a) Define soil? Write about soil formation, composition and characteristics?

Or

b) Write about effects of chemical dependent farming on yield and soil health?

10) a) What are macro and micro nutrients? Discuss about their functions in plant growth and development?

Or

b) What are fertilizers? Discuss about different types of fertilizers?

11) a) What is integrated farming? Discuss about integrating farming in detail?

Or

b) Write in detail about different cropping systems?

12) a) Discuss in detail about various types of organic compost?


Or

b) What is vermi composting? Write about small scale and large scale vermi composting?

13) a) Discuss in detail about various bacterial biofertilizers?

Or

b) Discuss in detail about mechanism of nitrogen fixation and phosphorus solubilization?

	Government College (Autonomous) Rajahmundry Department Of Biotechnology					
Practical Syllabus Paper-6B	Subject : Biotechnology		Program : B.Sc.			
	Title of Course “ Organic farming ”-Lab Course Code: BTL156P		Group : BBC Year-III Semester : 5 / 6			
	Total Hours – 30hrs ; Per Week -2hrs		L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Basic knowledge about organic farming technique.		0	0	2	1

Objectives:

- The students should be able to understand the principle behind the estimations.
- The students should be able to understand the concept behind the general soil tests

List of experiments:

1. Collection of different soil samples
2. Qualitative estimation of nitrogen, phosphorus and potassium in soil samples
3. Collection of fruit, vegetable and other domestic waste
4. Preparation of compost beds and introducing earthworms
5. Collection of vermin castings
6. Sieving, drying and packing of vermin compost
7. Visit to animal shed and observing farm yard manure production
8. Preparation of media and isolation of bio fertilizers.
9. Visit to organic farm to study the various components, identification and Utilization of organic products.
 10. Compost making- aerobic and anaerobic methods
 11. Vermi compost preparation
 12. Preparation of enriched farm yard manure
 13. Visit to organic clusters and bio control lab to study the maintenance of Bio fertilizers/bio-inoculant cultures
 14. Biological nitrogen fixers.
 15. Methods of application of Bio-pesticides (Trichocards, BT, NPV)
 16. Preparation of neem products and other botanicals for pest and disease Control
 17. Preparation of green pesticides
(panchagavya, beezamrutam, jeevamrutam, ghanajeevamrutam, dravajeevamrutam).
 18. Different methods of bio fertiliser applications.

Referencebooks:

1. Principles of Organic Farming:: by E Somasundaram,D Udhaya Nandhini,M Meyyappan ;2021
2. Organic farming in India:: by Arpita Mukherjee; 2017
3. Biofertilizer and biocontrol agents for agriculture;; by AM Pirtilä · 2021
4. Trends in Organic Farming in India;; by S. S. Purohit, 2006
5. Biofertilizers for Sustainable Agriculture and Environment;; by Bhoopander Giri Ram Prasad, Qiang-Sheng Wu, Ajit Varma; 2019

Virtual LabLinks

Co-curricular activities:

Mandatory:(Training of students by teacher on field related skills;15hrs)

1. **For teacher;** Training of students by teacher in laboratory and field for a total of 15hrs on soil sample collection, NPK analysis, collection of biodegradable waste, vermi composting, collection of castings, processing, drying& packing. In addition teacher should demonstrate the media preparation, sterilization, and isolation of microorganisms from soil.
2. **For students:** Visit to local organic farm, collection of earthworms, observing the crop growth raised in organic farms. Submission of field work report of 10 pages in the prescribed format.
3. Maximum marks for field work report:05

4. Suggested format for field work report: Title page, student details, content page, introduction, work done, findings, conclusion and acknowledgements.

5. Unit test (IE)

b. Suggested co-curricular activities:

1. Comparing mineral content in different agricultural soil
2. Learning techniques of basic instruments handling related to field work
3. Preparation of videos on compost preparation and application
4. Visit to local organic fields

Attending special lectures, group discussions and seminars on organic farming.



Government College (Autonomous) Rajahmundry
Department Of Biotechnology

Subject : Biotechnology

Group : BBC

B.Sc.-III yr
Semester-5/6
Paper- 6B

Title of Course
“ Organic Farming - Lab ”
Course code: BTL156P

Semester End Exam (2022-23)

Time : 3Hrs

Practical - Model Question Paper

Credits : 1

Marks : 50

- | | |
|---|-----------------------|
| 1. Major experiment. | 15M |
| Estimate the pH of soil in given sample ‘A’ | |
| 2. Minor experiment. | 10 M |
| Estimate the nitrogen content in given soil sample ‘B’ | |
| 3. Identify the given spotters and write a brief note on it | 15 M |
| A. Identify different earth worm species/photograph | |
| B. Sieving and processing of vermi compost - photograph | |
| C. VAM identification | |
| D. Farm yard manure | |
| E. Scientific observation and data analysis | |
| 4. Record | 05 M |
| 5. Viva-voce | 05 M |
| Total | -----
50M
----- |



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 7B	Subject : Biotechnology	Program : B.Sc .			
	Title of the Course “ Bio fertilizers and Bio pesticides production ” Course Code: BTL205	Group : BBC Year -III Semester : 5 /6			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lect ure	T Tutori al	P Pract ical	C Credits
Pre-requisites:		4	1	-	4

Course Objectives:

- To be able to understand the importance of bio fertilizers for sustainable agricultural practices .
- To Appreciate the role of VAM in solubilization
- To Define bio pesticide and its nature
- To Produce bio fertilizers and bio pesticides on large scale
- To be Able to prepare inoculums for field application

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	The pupil will understand the harms caused by chemical fertilizers and usefulness of Biofertilizers
CO2	The pupil will know in detail about naturally available low cost non harmful biofertilizers .
CO3	The pupil will understand the harms caused by chemical pesticides s and usefulness of Biopesticides.
CO4	The pupil will understand the methods of producing the biofertilizers and biopesticides in large scale in an economical way
CO5	The pupil will understand the methods of applying the biofertilizers and biopesticides to the agricultural field to get maximum yield which devoid of harmful chemicals

Course with focus on employability / entrepreneurship / Skill Development modules

<p>Skill Development</p>	<p>Measurement of water pollution, sources of water pollution. Microbiology of waste water treatment, aerobic processes, activated sludge, oxidation ponds, trickling filters, and rotating biological contactors. Anaerobic processes: Anaerobic digesters, upward flow anaerobic sludge blanket reactors.</p> <p>microbial groups involved in biogas production & interactions, factors affecting biogas production,</p> <p>Industrially important microbes, its screening, selection and identification</p>	<p>Employability</p>	<p>air pollution & its control through Biotechnology, Biofilters, Bioscrubbers, Biotrickling filter. Bioremediation of Hydrocarbons and its applications Degradation of pesticides and other toxic chemicals by microorganism</p> <p>Maintenance and preservation of industrially important microbial cultures.</p> <p>Microbial production of Organic acids (Lactic acid, citric acid), Amino acids (Glutamic acid, Aspartic acid and Lysine).</p>	<p>Entrepreneurship</p>	<p>Role of genetically Engineered Microbes, Concept of Phytoremediation, environmental safety guidelines</p> <p>Biofertilizers, Vermiculture.</p> <p>Strain Improvement, Basic concepts of fermentation; Design of fermenter and applications.</p> <p>dairy products (Cheese, Yogurt), beverages (Beer, Wine) and antibiotics (Streptomycin, Pencillin)</p>
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Unit -1 : Biofertilizers:-

Introduction, history, concept, scope of bio fertilizers in India. Classification, microorganisms used as bio fertilizers. Bacterial, fungal and algal bio fertilizers. Symbiotic and a symbiotic microorganisms. Mechanism of nodulation and nitrogen fixation.

Unit - 2 : Mycorrhizal biofertilizers : -

Importance, types, characteristic features of ecto and endomycorrhiza. Mechanism of phosphorus solubilization. Uptake of phosphates by the roots. Consortium based inoculums and significance.

Unit - 3 : Bio pesticides : -

Definition, concept, history, scope and importance of biopesticides.

Classification - botanicals, bacterial, fungal and viral based biopesticides. Mechanism of action of *Bacillus thuringiensis* and *Trichoderma viridiae* as bio control agents.

Unit - 4 : Mass production techniques:-

Media, types, preparation. Methods of isolation, streak plate, spread plate and pour plate techniques, purification and identification of microorganisms used as bio fertilizers and bio pesticides. Mass production and packing techniques.

Unit – 5 : Field application methods:-

Preparation of carrier based inoculum. Sphagnum, peat, vermiculite as inoculums carriers. Dosage standardisation. Seed treatment, foliar application, root dressing and soil application techniques. Storage and maintenance of inoculum.

References:

1. Biofertilizers: Commercial Production Technology and Quality Control, 2017 by Dr. P.Hyma
2. Biofertilizers Technology, 2010, by S.Kaniyan, K.Kumar and K. Govindarajan
3. Biofertilizers for Sustainable Agriculture, 2017; by Arun K Sharma
4. Advances In Plant Biopesticides 2021, by Dwijendra Singh, Springer India
5. A Textbook of Integrated Pest Management, 2013 by Ram Singh & Vikas Jindal G.S. Dhaliwal

Cocurricularactivities:

a) **Mandatory:** (Training of students by teacher on field related skills:15hrs)

1. **For teacher:** Training of students by teacher on preparation of different microbial media, isolation techniques – streak plate , spread plate, pour plate, Grams staining of bacteria , VAM and Trichoderma observation. Preparation of Rhizobium inoculum and application to legume seedlings.
2. **For students:** Raising of seedlings of Leguminaceae species, maintaining of the seedlings in nursery/green house. Comparing the growth of seedlings treated with biofertilizer and chemical fertilizer. Visit to Bio fertilizer and Bio pesticides commercial lab. Submission of field work report of 10 pages in the prescribedformat.
3. Maximum marks for field workreport:05
4. Suggested format for field work book; Title page, student details, content page,introduction, work done, findings, conclusion and acknowledgements.
5. Unit test(IE).

b) Suggested co-curricularactivities;

1. Training of students by the industrialexperts
2. Identification and collection of botanical pesticides
3. Assignments/seminars/group discussion /quiz on bio fertilizers and biopesticides
4. Preparation of videos, charts on inoculum development and fieldapplication
5. Attending invited guest lectures on the concerntopics

WebLinks:

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Subject : Biotechnology

Group : BBC

**B.Sc.-IIIyr
Semester-5/6
Paper- 7B**

**Title of Course
“ Bio fertilizers and Bio pesticides production”
Course Code :BTL205
Semester End Exam (2022-23)**

Time : 2 1/2 Hrs

Blue Print of Question Paper

Marks : 50

Part – A

I. Essay questions: answer any 4 : 4 X 10 = 40 M

➤ **Question 1 from Unit I**

➤ **Question 2 from Unit II**

➤ **Question 3 from Unit III**

➤ **Question 4 from Unit IV**

➤ **Question 5 from Unit V**

➤ **Question 6 from additional input**

Part-B

II. Short answer questions : Answer all the 5 Questions 5 X 2 = 10 M

➤ **Question 7: from Unit I**

➤ **Question 8: from Unit II**

➤ **Question 9: from Unit III**

➤ **Question 10: from Unit IV**

➤ **Question 11: from Unit V**



Government College (Autonomous) Rajahmundry
Department Of Biotechnology

Subject : Biotechnology

Group : BBC

B.Sc.-IIIyr
Semester-5/6
Paper- 7B

Title of Course
“ Bio fertilizers and Bio pesticides production ”
Course Code : BTL205
Semester End Exam (2022-23)

Time : 2 1/2 Hrs

Model Question Paper

Marks : 50

Part-A

(Answer any five questions. Each answer carries 10 marks)

- 1) Bacterial biofertilizers
- 2) Symbiotic microorganisms
- 3) Micorrhiza
- 4) Phosphates uptake
- 5) *Bacillus thuringiensis*
- 6) Microbiological media
- 7) Seed treatment
- 8) Storage of inoculum

SECTION-B

(Total: 5x10=50Marks)

(Answer any five questions. Each answer carries 10 marks)

- 9) a) Write about scope and importance of biofertilizers?
or
b) Write in detail about mechanism of nodulation and nitrogen fixation?
- 10) a) Write about importance and characteristic features of ecto and endomycorrhiza?
or
b) Write about mechanism of phosphorus solubilization in plants?
- 11) a) What is biopesticide? Discuss in detail about different types of biopesticides?
or
b) Write about mechanism of action of *Bacillus thuringiensis* and *Trichoderma viridiae* as bio control agents
- 12) a) Write about different methods of isolating microorganisms?
or
b) Discuss in detail about mass production and packing techniques?
- 13) a) Discuss in detail about various carrier-based inoculums?
or
c) Write about different field application techniques?



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-7B	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Bio fertilizers and Bio pesticides production ”-Lab Course Code: BTL205 P	Group : BBC Year-III Semster : 5 / 6			
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Handling of pipettes. Preparation of Solutions Handling of analytical instruments.	0	0	2	1

Objectives


- To be able to prepare various media for microbial growth .
- To be able to isolate and grow useful microbes used as biofertilizers.
- To be able to identify microbes in soil .
- To be able to Produce bio fertilizers and bio pesticides on large scale
- To be able to prepare inoculums for field application and test for successful association of inoculum with target roots.

List of Experiments/Syllabus:

1. Preparation of Nutrient agar, YEMA, and PDA media
2. Isolation of *Rhizobium* from root nodules
3. Isolation of *Azotobacter* from soil samples
4. Isolation of *Trichoderma*
5. Gram staining of bacteria
6. VAM root staining
7. Raising of legume seedlings with *Rhizobium* treatment
8. Visit to commercial bio control units and Krishi seva Kendra

Referencebooks:

Virtual LabLinks:

	Government College (Autonomous) Rajahmundry Department Of Biotechnology		
	Subject : Biotechnology		Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 7B	Title of Course “ Bio fertilizers and Bio pesticides production ”-Lab Course code: BTL205P Semester End Exam (2022-23)		
Time : 3Hrs	Practical - Model Question Paper	Credits : 1	Marks : 50

Major Question :

1. Identify the given microbial sample based on morphological characteristics ‘A’ 15M

Minor Question :

2. Identify the given culture based on microscopic Observation ‘B’ 10 M
3. Spotters (Scientific observation and data analysis) 5 x 3 =15M

- A. Identify the given algal fertilizer/photograph
 B. Identify the fungal bio fertilizer -photograph
 C. VAM identification
 D. Seed treatment

4. Record 5M
5. Viva-voce 5M

 Total = 50M



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Theory Paper - 6C	Subject : Biotechnology	Program : B.Sc			
	Title of the Course “ Techniques in Nursery Development ” Course Code: BTL204	Group : BBC Year -III Semester : 5/6			
	Total Hours Allocated - 60 ; Per Week -4 hrs	L Lect ure	T Tutori al	P Pract ical	C Credits
Pre-requisites:	➤	4	1	-	4

Course Objectives:

- To enable the pupil to understand the types of nurseries
- To impart the pupil the knowledge of facilities and expertise required to set up nursery
- To impart skills to the pupil to procure employment or to become entrepreneur

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	➤ Understand different types of nurseries
CO2	➤ Identify various facilities required to set up of a nursery
CO3	➤ Understood expertise related to various practices in a nursery
CO4	➤ Acquire skills to get an employment or to become an entrepreneur.
CO5	

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

UNIT -1: Introduction to Nursery

Definition, objectives and importance. Basic requirements for a nursery layout and components of a good nursery. Types of nurseries. Bureau of Indian standards (BIS - 2008) related to nursery.

UNIT-2: Nursery inputs

Tools, implements and containers. Nursery media. Electricity, equipment and machinery management. Types of nursery beds and their preparations. Precautions and maintenance of nursery beds.

UNIT -3: Seeds and Propagules

Selection of seed and different sowing methods. Use of different plant parts for vegetative propagation to raise nursery. Different techniques of vegetative propagation.

UNIT- 4: Management Practices

Routine seasonal operations in a nursery. Supply of water, nutrients and removal of weeds. Identification of pests and diseases, control and prevention methods.

UNIT – 5: Grafting techniques

Introduction to grafting, definition, types and tools for grafting. Steps involved in simple, splice graft, tongue graft, Whip graft, cleft graft and wedge graft. Grafting of horticultural & floricultural crops and applications.

Recommended Books:


1. Ratha Krishnan, M., *et al.* (2014) PlantNursery
2. Management: Principles and Practices, Central Arid Zone Research Institute ICMR, Jodhpur, Rajasthan.
3. VikasKumar, Anjali Tiwari, Practical manual of Nursery management, Agri – biotech Press, New Delhi.
4. TaraiRanjan Kumar, (2020) Plant propagation and nursery management, New India Publishers.
5. P.K.Ray, (2020) Essentials of plant nursery management.
6. P.K.Ray, (2012) How to start and operate a PlantNursery.

WebLinks:

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1

 A	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 6C	Title of Course “ Techniques in Nursery Development ” Course Code :BTL204 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Blue Print of Question Paper	Marks : 50

Part –


I. Essay questions: answer any 4 : 4 X 10 = 40 M

- Question 1 from Unit I
- Question 2 from Unit II
- Question 3 from Unit III
- Question 4 from Unit IV
- Question 5 from Unit V
- Question 6 from additional input

Part-B

II. Short answer questions : Answer all the 5 Questions 5 X 2 = 10 M

- Question 7: from Unit I
- Question 8: from Unit II
- Question 9: from Unit III
- Question 10: from Unit IV
- Question 11: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 6C	Title of Course “ Techniques in Nursery Development ” Course Code : BTL204 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

Part – A

Answer any 4 of the following essay questions 4 X 10= 40M


Note: Draw Diagrams wherever necessary for both essay and short answers

1. Describe Genetic Code characteristics in detail
2. Describe the process of translation in detail.
3. Describe the regulation of Lac operon in detail
4. Describe the various vectors used in genetic engineering
5. Describe different types of cloning vectors
6. Describe construction, advantages and applications of Cdna library.

Part-B

Answer All the five of the following short answer questions 5 X 2= 10M

7. Shine Dalgarno sequence
8. Post translational modification
9. Rho factor mediate determination
10. Transfection
11. Primer

	Government College (Autonomous) Rajahmundry Department Of Biotechnology						
Practical Syllabus Paper-6C	Subject : Biotechnology			Program : B.Sc			
	Title of Course “ Techniques in Nursery Development ”-Lab Course Code: BTL204 P			Group : BBC Year-III Semester : 5/6			
	Total Hours – 30hrs ; Per Week -2hrs			L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Handling of pipettes. Preparation of Solutions Handling of analytical instruments.			0	0	2	1

Objectives:


5. The students should be able to understand the principle behind the estimations.
6. The students should be able to understand the concept behind the general tests

List of Experiments/Syllabus:

1. Demonstration of different types of nurseries
2. Handling of nursery tools, equipment and types of containers
3. Laying of nursery bed with soil and Seed collection, treatment and rising of seedlings on nursery bed
4. Handling of grafting and layering techniques in the nursery
5. Watering, weeding and management of nursery
6. Maintaining of the seedlings / cuttings in the nursery


Reference books:

Virtual Lab Links:

	Government College (Autonomous) Rajahmundry Department Of Biotechnology		
	Subject : Biotechnology		Group : BBC
B.Sc.-I yr Semester-2 Paper- 2	Title of Course “ Techniques in Nursery Development ”-Lab Course code: BTL204 P Semester End Exam (2022-23)		
Time : 3Hrs	Practical - Model Question Paper		Credits : 1 Marks : 50

- | | |
|---|------|
| 1. Major experiment. | 15 M |
| 2. Minor experiment. | 10 M |
| 3. Identify the given spotter and a brief note Unit | 15 M |
| 4. Record | 05M |
| 5. Viva-voce | 05M |

Total 50 M

	Government College (Autonomous) Rajahmundry Department Of Biotechnology					
	Theory Paper - 7C	Subject : Biotechnology		Program : B.Sc		
Title of the Course “ Crop Improvement Technology ” Course Code: BTL148		Group : BBC Year -III Semester : 5/6				
Total Hours Allocated - 60 ; Per Week -4 hrs		L Lect ure	T Tutori al	P Pract ical	C Credits	
Pre-requisites:	➤ Traditional Crop Improvement Techniques. ➤ Basic Plant Tissue Culture Techniques		4	1	-	4

Course Objectives:

- This course aims to teach plant tissue culture.
- This course gives idea about transgenic plants.

On Completion of the course, the students will be able to-	
CO1	The students will gain knowledge of plant tissue culture.
CO2	The students will be able to understand the micropropagation technique which is useful in commercial purpose.
CO3	The students will have knowledge of recombinant technology in plants.
CO4	The students will understand the concept of transgenic plants
CO5	The students will understand how transgenic plants are used in crop improvement.

<p>Skill Development</p>	<p>Introduction to plant tissue culture – History – Scientists – Terminology , Steps in general tissue culture Lab Organisation – Types of sterilization and nutrient media – Types of cultures – Organ cultures, cell suspension culture, callus culture, pollen culture and their application Micro propagation Procedure techniques Types of sterilization and nutrient media</p>	<p>Employability</p>	<p>Recombinant DNA methods - Introduction to genetic engineering – Definitions – Gene cloning - Vectors. Gene transfer methods – Indirect methods (Agrobacterium) and direct methods (particle bombardment/gene gun method; chemical-PEG mediated and other methods) with case studies / examples.</p>	<p>Entrepreneurship</p>	<p>Protoplast isolation and fusion – Somatic hybridization – Cybrids – Somaclonal variations and applications in crop improvement – Cryo preservation RFLP, RAPD and SSR Marker assisted selection for crop improvement</p>
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Syllabus

Unit I:

Introduction to plant tissue culture – History – Scientists – Terminology, Steps in general tissue culture Lab Organisation – Types of sterilization and nutrient media – Types of cultures – Organ cultures, cell suspension culture, callus culture, pollen culture and their application

Unit II:

Micro propagation – Procedure techniques – Organogenesis and Embryogenesis – Problems – Advantages – Limitations - Applications of Micro propagation. Anther culture – embryo culture – Ovule culture – Somatic embryogenesis - Synthetic seeds and its applications.

Unit III:

Protoplast isolation and fusion – Somatic hybridization – Cybrids – Soma clonal variations and applications in crop improvement – Cryo preservation

Unit IV:

Recombinant DNA methods - Introduction to genetic engineering – Definitions – Gene cloning - Vectors. Gene transfer methods – Indirect methods (Agrobacterium) and direct methods (particle bombardment/gene gun method; chemical-PEG mediated and other methods) with case studies / examples.

Unit V:

Transgenic plants – Present status - Applications in crop improvement – Limitations – biotechnology regulations. Markers - Morphological, biochemical and molecular markers – RFLP, RAPD and SSR – Marker assisted selection for crop improvement.

Additional Input: Transgenic plants for crop improvement .

Syllabus :

Unit I:

Introduction to plant tissue culture – History – Scientists – Terminology, Steps in general tissue culture Lab Organisation – Types of sterilization and nutrient media – Types of cultures – Organ cultures, cell suspension culture, callus culture, pollen culture and their application

Unit II:

Micro propagation – Procedure techniques – Organogenesis and Embryogenesis – Problems – Advantages – Limitations - Applications of Micro propagation. Anther culture – embryo culture – Ovule culture – Somatic embryogenesis - Synthetic seeds and its applications.

Unit III:

Protoplast isolation and fusion – Somatic hybridization – Cybrids – Soma clonal variations and applications in crop improvement – Cryo preservation

Unit IV:

Recombinant DNA methods - Introduction to genetic engineering – Definitions – Gene cloning

- Vectors. Gene transfer methods – Indirect methods (Agrobacterium) and direct methods (particle bombardment/gene gun method; chemical-PEG mediated and other methods) with case studies / examples.

Unit V:

Transgenic plants – Present status - Applications in crop improvement – Limitations – biotechnology regulations. Markers - Morphological, biochemical and molecular markers – RFLP, RAPD and SSR – Marker assisted selection for crop improvement.

Additional Input: Transgenic plants for crop improvement

References:

Plant tissue culture by Bhojwani and M.K.Rajdan

1. Elements of Biotechnology by P.K.Gupta
2. Biotechnology by V.Kumaresan
3. Plant Biotechnology by H.S.Chawla
4. Biotechnology by U.Satyanarayana

WebLinks:

1. <https://science.umd.edu/classroom/bsci124/lec41.html>
2. <https://academic.oup.com/jxb/article/51/342/1/485700>

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS O1	PS O2	PS O3
CO1	3	2	1	2	2	2	1	1	1	4	3	2	1
CO2	3	2	1	2	2	2	1	1	1	4	3	2	1
CO3	3	3	2	2	2	2	1	1	1	4	3	2	1
CO4	3	3	1	2	3	1	1	2	1	4	3	2	1
CO5	3	3	1	3	3	2	1	1	2	1	3	2	1



Government College (Autonomous) Rajahmundry
Department Of Biotechnology

Subject : Biotechnology

Group : BBC

B.Sc.-IIIyr
Semester-5/6
Paper- 7C

Title of Course
“ Crop Improvement Technology ”
Course Code :BTL148
Semester End Exam (2022-23)

Time : 2 1/2 Hrs

Blue Print of Question Paper

Marks : 50

Part – A

I. Essay questions: answer any 4 : 4 X 10 = 40 M

➤ **Question 1 from Unit I**

➤ **Question 2 from Unit II**

➤ **Question 3 from Unit III**

➤ **Question 4 from Unit IV**

➤ **Question 5 from Unit V**

➤ **Question 6 from additional input**

Part-B

II. Short answer questions : Answer all the 5 Questions 5 X 2 = 10 M


➤ **Question 7: from Unit I**

➤ **Question 8: from Unit II**

➤ **Question 9: from Unit III**

➤ **Question 10: from Unit IV**

Question 11: from Unit V

	Government College (Autonomous) Rajahmundry Department Of Biotechnology	
	Subject : Biotechnology	Group : BBC
B.Sc.-IIIyr Semester-5/6 Paper- 7C	Title of Course “ Crop Improvement Technology ” Course Code : BTL148 Semester End Exam (2022-23)	
Time : 2 1/2 Hrs	Model Question Paper	Marks : 50

Part – A

Answer any four essay questions

4 X 10 = 40M

1. Write an essay on preparation of plant tissue culture media.
2. What is micropropagation. write in detail about somatic embryogenesis and its applications.
3. Write in detail about cybrids.
4. Write about Agrobacterium mediated gene transfer method in plants.
5. Write an essay on molecular markers used for crop improvement .
6. Write an essay on applications of transgenic plants in crop improvement

Part – B

5 x 4 = 20M

II. Answer all the questions

7. Pollen culture
8. synthetic seeds
9. Cryopreservation.
10. Gene gun method
11. Applications of Molecular markers.



**Government College (Autonomous) Rajahmundry
Department Of Biotechnology**

Practical Syllabus Paper-7C	Subject : Biotechnology	Program : B.Sc			
	Title of Course “ Crop Improvement Technology ”-Lab Course Code: BTL148P	Group : BBC Year-III Semester : 5/6			
	Total Hours – 30hrs ; Per Week -2hrs	L Lect ures	T Tuto rial	P Practical	C Credits
Pre-requisites:	Basic knowledge about crop improvement technology .	0	0	2	1

Objectives:

- To enable the pupil to understand the modern techniques of crop improvement

List of Experiments/Syllabus:

1. Preparation of Plant tissue culture medium
2. Callus culture
3. Regeneration from callus cells
4. Cytology of callus
5. Suspension culture.
6. Isolation of Protoplast
7. Anther culture
8. Preparation of synthetic seeds

Referencebooks:

Virtual LabLinks:



Government College (Autonomous) Rajahmundry
Department Of Biotechnology

Subject : Biotechnology

Group : BBC

B.Sc.-IIIyr
Semester-5/6
Paper- 7C

Title of Course
“ Crop Improvement Technology “ - Lab ”
Course code: BTL148P
Semester End Exam (2022-23)

Time : 3Hrs

Practical - Model Question Paper

Credits : 1 **Marks : 50**

1. Major experiment.	15 M
2. Minor experiment.	10 M
3. Identify the given spotters and write a brief note on it	15M
4. Record	05 M
5. Viva-voce	05 M

	Total 50 M

Government College (Autonomous), Rajamahendravaram
Department of Biotechnology
College Specific : Allocation of Internal component (CIA : SEE as 50:50)

Concept document on CIA : SEE as 50:50 (April 2021)

Prologue

The Assessment has been a common practice in educational institutes to evaluate, measure, and document the academic inclination, learning progress, and skill attainment of students through out their learning in the institution by systematically gathering information about their academic performance. Assessment is very important for tracking their academic progress thereby planning further steps and also for reporting and involving parents in policy making and curriculum design. Out of different terminologies used for assessment (such as Measurement, Tests, Examination, Appraisal and Evaluation), Examinations have become an indispensable tool in evaluating both curriculum and student performance as well as the adaptability and core competency of the faculty involved. The examinations involve written exercises, Oral questions or practical tasks, set to test a candidate's knowledge and skill. Evaluation is a broader term that refers to systematic acquisition and assessment of information to provide useful feedback about students through which the students learning abilities and teachers teaching abilities can be assessed. It can also be used to identify and address the students learning needs.

Generally, continuous internal examinations and semester end (external) examinations have been used to evaluate academic performance. More importantly, parents are informed about their wards academic progress and made involved in policy making.

Existing Practice

After conferred with autonomous status by UGC in the year 2000, the Government College (Autonomous), Rajamahendravaram has enhanced the CIA: SEE as 25:75, from 20:80, on par with the affiliating university. During the academic year 2016, the CIA: SEE is further reformed and made 40:60. It is to be noted here that the institution is in the IV cycle of autonomy as well as accreditation.

Further, the autonomy review committee which visited the institution during 2015, for extension of autonomy, orally suggested to have more marks for internal assessment than the SEE. Similarly, the NAAC Peer team in its visit to the institution for III cycle of accreditation during March 2019, has remarked and appreciated the move of institution to go with 50:50 for CIA and SEE. Therefore, the institution is going to implement the 50:50 scheme from the academic year 2019 - 2020. Following is the Standard Operating Procedure for the internal assessment.

Standard Operating Procedure for Continuous Internal Assessment (Internal Marks – 50)

The Internal marks in all the courses/subjects will be awarded based on continuous internal assessment made during the semester concerned. For each Course/subject 50 marks are allotted for internal assessment and 50 marks are allocated for the End Semester Examination.

Continuous Internal Evaluation (CIA):

It has been decided to introduce Continuous Internal assessment marks for a total of **50 marks**, which are to be distributed as follows:

S.No.	Component	Distribution of Marks
1	CIE I (after completion of 50% of syllabus)	20
2	CIE II (Online Exam)	10

3	ATTENDANCE/ EXTENSION SERVICE/NSS / CLEAN AND GREEN	Above95%	5	5
		91%to 95%	4	
		86%to 90%	3	
		81%to 85%	2	
		75%to 80%	1	
		Below75%	0	
Pedagogical Strategies				
4	ASSIGNMENT			5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/ FieldVisit/Survey			5
6	Viva-voce			5
TOTAL				50

Component I :CIEI& CIEII(20+10 =30Marks)

Two Internal Examinations, out of which one is Mandatorily Online examination,for each Course shall be conducted for assessment. These examinations will be conducted during August/September(CIE –I) and January/February (CIE-II). CIE-I carries 20 marks and CIE-IIcarries10marks. CIE-I will be conducted after completion of 50% of syllabus. These second internal examination, i.e., CIE–II, which is **mandatorily online examination** will cover the entire syllabus and consists of 20multiple choice questions having ½mark for each question. The sum of both the CIEs will be considered for awarding marks for CIA.

1.1.1. Suggestive Question Paper Pattern for CIEI&CIEII (Based on Blooms Taxonomy):

Though the faculty concerned are empowered to adopt their own pattern for question paper,agenera and suggestive model for question paper is given below based on Blooms Taxonomy.

Q. No	Learning Objective	Marks
1	Memory based (Remember)	2
2	Understand(Comprehension)	2
3	Application	3
4	Analysis	3
5	Evaluation	5
6	Creativity	5
	TOTAL	20marks

The active verbs used to frame the question based on Blooms Taxonomy is given below for the convenience.

Active verbs developed based on Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	Identify	Manipulate	survey	grade	produce
discover	indicate	Paint	advertise	measure	rearrange
duplicate	Infer	Prepare	appraise	predict	rewrite
enumerate	relate	produce	Break down	rank	role-play

IE II will consist of multiple choice questions (MCQs). Number of questions and distribution of marks is at the discretion of the faculty concerned. However, a half an hour exam consisting of 20 MCQs with ½ mark for each question is suggestible in view of the huge number of students. All the HODs should supply a question bank of MCQs of all the courses covering the entire syllabus along with key to the Computer Science department to enable them to conduct the online examination in the designated laboratories. Alternatively, all the HODs may upload the MCQs in the portal throughout their logins.

Further, all the HoDs should submit their schedule of CIE II to IQAC in advance to monitor the systematic conduct of the online examination.

Important Note:

Students who absent themselves from any CIE will lose the marks for the respective test

.However, if a student is not able to write the CIE I / II because of his/her participation in an important event related to NSS/NCC or Games/Sports representing the College/University/health grounds, the student has to get the prior permission of the Principal through the proper channel and submit the same to the Office of the Controller of Examinations. Deadline is 7 days after the CIE. Applications submitted after the deadline will not be considered for the retest.

Component III: Attendance (5 Marks)

Attendance mark will be awarded to the students based on their attendance percentage on a particular course. Faculty of each course has toward the attendance mark based on their subject attendance. The marks split-up is given below

Above 95%	5
91% to 95%	4
86% to 90%	3
81% to 85%	2
75% to 80%	1
Below 75%	0

Component IV: Assignment (5 Marks)

One Assignment for each course must be submitted by a student in each semester. The marks allotted to this component will be awarded based on the performance of the student. The assignment topic may be assigned either individually or group. Assignment should be

submitted by the student in the first half of the semester. Also maximum of 7 days should be given to students to submit the assignment. Assignments should be evaluated by the faculty concerned and the same to be verified by the student. The assignment should be kept in department for the Academic Audit by IQAC and also for external academic audit conducted by office of Commissionerate of Collegiate Education. The marks should be awarded by the faculty.

Component V (Pedagogical Strategies): Participation/Paper Presentation in Student Seminars/Workshops/ Group Discussions/Quiz/Student Study Project/Field Visit/Survey (5 Marks)

For this component, the marks will be provided to student, if he/she participate / win in the external college technical events. To score marks, the student has to participate / present papers related to subject in the technical events organized in the other colleges/other departments in the college.

Name of the event	Participation	Second Prize	First Prize/ Best Paper
Workshop/Seminar/Technical Symposium	2	3	5
National/International Conference	3	4	5

In case of Classroom seminar, one seminar for each course must be presented by a student in each semester. Each student should be given individual topic for seminar, the student has to submit the seminar topic as assignment and the same will be presented minimum of 10 minutes in the class through ICT. The seminar presented by the student should be evaluated by the subject faculty and based on the performance of the presentation, the marks will be awarded. Similarly, reports on field visits, educational tours, and study projects in prescribed form at will be considered for awarding marks in this component.

In case of Quiz, preferably online quiz, it should be conducted after the CIE II and well before the SEE. Faculty concerned has to announce the schedule for the quiz and create the quiz in the ERP (College Management System). The subject staff has to upload all the questions (unit-wise) in the ERP. Quiz should be created with 30 questions (ERP should choose 30 questions randomly out of 100 questions uploaded). Then timing for quiz should be 30 minutes. No negative marking. Each question carries 1 mark. The marks secured should be converted to 10.

Semester End Examinations (SEE)

For all Semesters, the question paper will be of 2 ½ hrs duration for 50 marks. The suggestive question paper model given in section 1.1.1. May be used for framing the question. This kind of question paper will be helpful in CO-PO Mapping and there by graduate attributes.

(Prepared by IQAC & Academic Cell and submitted to the Chairman, IQAC & Principal on April 2019)

CBCS CURRICULAR FRAME WORK(2020-21ONWARDS)-BACHELOR OF SCIENCES

Subjects		SEMI		SEM II		SEM III	SEMIV		SEM V		SEMVI	
		Hrs/W	Credi ts	Hrs/W	Credi ts	Credi ts	Hrs / W	Credi t s	Hrs/W	Credi ts	Hr s/W	Credits
Languages												
English		4	3	4	3	3						
Language (H/T/S)		4	3	4	3	3						
Life Skill Courses		2	2	2	2	2+2						
Skill Development Courses		2	2	2+2	2+2	2						
Major1	Core1,2,3,&4	4+2	4+1	4+2	4+1	4+1	4+2	4+1				
Major2	Core1,2,3,&4	4+2	4+1	4+2	4+1	4+1	4+2	4+1				
Major3	Core1,2,3,&4	4+2	4+1	4+2	4+1	4+1	4+2	4+1				
Major1	Core-5						4+2	4+1				
Major2	Core-5						4+2	4+1				
Major3	Core-5						4+2	4+1				
Major 1	Skill Enhancement Courses(6&7)								4+2	4+1		
									4+2	4+1		
Major 2	Skill Enhancement Courses(6&7)								4+2	4+1		
									4+2	4+1		
Major 3	Skill Skill Enhancement Courses(6&7)								4+2	4+1		
									4+2	4+1		

THIRD PHASE of APPRENTICESHIP
Entire 5th / 6th Semester

FIRST and SECONDPHASES (2 spells) of APPRENTICESHIP
between 1st and 2nd year
And
between 2nd and 3rd Year
(two Summer vacations).

Government College (A), Rajamahendravaram



**Certificate course on
“Biophysical and microbiological techniques”
Offered by
Department of Biotechnology
GDC (A) RJY**

Government College (A), Rajamahendravaram
Department of Biotechnology
Certificate course on
“Biophysical and microbiological techniques”
Theory syllabus (2020-21)

Total Instruction hours : 60hrs

Marks : 50

Unit-I:

Buffers- preparation of solution (molarity, normality, molality), preparation of standard buffers(acidic, basic, neutral), determination of pH of the solution.

Unit-II:

Colorimeter/ UV Spectrophotometer: Principle, construction and its applications.

Chromatography: partition principle, partition coefficient, brief account of paper chromatography, thin layer chromatography

Unit -III:

Gel electrophoresis: types of gels, Agarose gel electrophoresis, SDS-PAGE and applications

Centrifugation: Basic principle, concepts of RCF, types of centrifuges (clinical, high speed and ultracentrifuges), Application of fractionation in research.

Unit-IV:

Microscopy - Light microscope- Parts of microscope and its uses

sterilization methods - Physical, chemical and radiation

Isolation of of microorganisms - serial dilution, pure cultures isolation methods, culture media - types;

Identification of bacteria - simple staining and Gram's staining

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Government College (A), Rajamahendravaram
Department of Biotechnology
Certificate course on
“Biophysical and microbiological techniques”
Model question paper(2020-21)

Time: 3hrs

Max.marks:50M

Answer any FIVE questions and draw labelled diagram where ever necessary. 5×10 = 50M

1. Explain the preparation of standard acidic buffer solution
2. Describe about principle and applications of light microscope
3. Write an essay on SDS-PAGE.
4. Write about the principle and types of centrifuges.
5. Write a brief account on paper chromatography.
6. Describe the principle and applications of colorimeter.
7. Write about different methods of isolation of pure culture
8. Describe gram staining method.

Blue print

Time: 3hrs

Max.marks:50

UNIT	Essay
Unit – I	2
Unit – II	2
Unit – III	2
Unit – IV	2

Government College (A), Rajamahendravaram
Department of Biotechnology
Certificate course on
“Biophysical and microbiological techniques”
Practical syllabus(2020-21)

1. Preparation of standard buffers and determination of pH of a solution
2. Gel electrophoresis of DNA
3. SDS-PAGE of protein
4. Paper chromatography of amino acids or sugars
5. TLC of sugars or amino acids
6. Quantitative estimation of carbohydrates
7. Quantitative estimation of proteins
8. Quantitative estimation of nucleic acids
9. Preparation of media, sterilization
10. Isolation of bacteria
11. Simple staining of bacteria
12. Gram staining of bacteria

NOTE: Depending on the availability of chemicals and equipment, any 10 of the above practicals should be performed.

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Government College (A), Rajamahendravaram
Department of Biotechnology
Certificate course on
“Biophysical and microbiological techniques”
Practical model question paper (2020-21)

Time: 3hrs

Max.marks:50M

- | | |
|---|---------|
| 1. Perform SDS-PAGE for the given oligomeric protein and determine its molecular weight | 15M |
| 2. Identify the given bacterial culture by gram staining method | 10M |
| 3. Identify the given Spotters | 3×5=15M |
| 4. Record | 5M |
| 5. Viva-voice | 5M |

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