

Ref: RU/FOS/BT/UG/2017/01

Dated: 06.05.2017

Department of Biotechnology
Minutes of Meeting
Boards of Studies

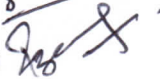
A meeting of Boards of Studies of B.Sc. (Hons.) Biotechnology in Department of Biotechnology held on 06.05 2017 at 10:30 AM in Dean Office. The following members were present:


1. Dr. Ajay Kumar
2. Dr. Vivek Srivastava
3. Mr. Anjani Kumar Srivastava
4. Mrs. Rati Bajpai
5. Dr. Deeksha Ranjan
6. Prof. (Dr.) Nand Lal
7. Er. Vishal Kumar Srivastava

Chairperson 

Member 

Member 

Member (Invited) 

Member (Invited) 

External Member 

External Member 

Agenda:

1. Action Taken Report (ATR) on Minutes of Previous Meeting.

The BOS committee confirmed the minutes of the BOS meeting held on 26.05. 2016.

2. Review of the existing programs and their curricula

S. No.	Item No.	Existing	Recommendation /Action Taken
1	RU/FOS/BT/UG/2014 /001 To consider the revised evaluation scheme for B.Sc (Hons) Biotechnology students admitted in the session 2017-18	<ul style="list-style-type: none"> • In existing evaluation scheme for the said batch, total credits = 144. • The following changes were proposed: <p>Semester I :</p> <p>The following subjects should be merged and offered as single core subject</p> <ul style="list-style-type: none"> • BBS-104 Computer fundamental and office automation and BBS-152 Computer fundamental and 	<p>The BOS approved the revised evaluation scheme for B.Sc (Hons) Biotechnology students admitted in the session 2017-18 and accepted the following recommendations:</p> <p>Total credit = 144 (No change in credit)</p> <ul style="list-style-type: none"> • BBS-114 Cell Biology and BBS-115 was introduced in 1st Semester in place of BBS-104 Computer fundamental and office automation and BBS-152 Computer fundamental.



		<p>office automation Lab was removed and reintroduced in later semester.</p> <ul style="list-style-type: none"> • BBS-105 Elementary Mathematics was removed. <p>Semester II :</p> <ul style="list-style-type: none"> • BBS-203 Cell Biology and BBS-204 Microbiology were removed • BBS-251 Cell Biology Lab and BBS-252 Microbiology Lab were removed. <p>Semester VI :</p> <ul style="list-style-type: none"> • BBS-602 Cell and tissue culture techniques theory subject was removed, 	<ul style="list-style-type: none"> • BBS-251 Cell Biology Lab and BBS-252 Microbiology Lab were merged and offered as BBS-162 cell and microbiology lab in semester Ist. • BBS-213 Computer fundamental and office automation and BBS-214 Elementary mathematics were introduced in IInd Semester. • BBS-262 Computer fundamental Lab were introduced in Semester IInd • BBS-612 Nanobiotechnology was introduced in VIth Semester
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3. Consideration of the curricula of the new programs

S. No.	Item No.	Feedback from Faculty/subject experts/Industries	Recommendation /Action Taken
1	Report of feedback on curriculum by stakeholder	<ul style="list-style-type: none"> • The departmental faculties are suggested that add some new objectives/Experiments regarding isolation of enzyme in Enzymology lab, in III semester. • One suggestion for bioinformatics lab in IV semester, experiment 1 is not suitable /possible to 	<ul style="list-style-type: none"> • The experts of BOS, said that it is good suggestion from faculties, have recommended for two experiments in Enzymology lab. • Regarding point 2 we can change it from other one experiment.

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The meeting concluded with a vote of thanks to the chair.

Date of the Next Meeting: to be decided and conveyed later

(Chairperson)

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members


Signature: 1..... 

Name: Dr. Vivek Srivastava

Date:

Signature: 2..... 

Name: Er. Anjani Kumar Srivastava

Signature: 3..... 

Name: Mrs. Rati Bajpai

Date:

Signature: 4..... 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1..... 

Name: Prof. Nand Lal

Date:

Signature: 2..... 

Name: Er. Vishal Kumar Srivastava

Encl.: Recommended Curricula attached for consideration and approval.

CC:

1. Dean

2. Registrar Office



PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO 1: To impart knowledge and skills in techniques of basic sciences related to biological and chemical sciences.

PEO 2: To develop human resource and entrepreneurs in biotechnology with the ability to independently start their own ventures or small biotech units in the field of biotechnology.

PEO 3: Scale up of biochemical process after designing, optimization and analysis for developing products required for society.

PEO 5: Tabulation and interpretation of Biological data using computer software.

PEO 6: To train the students for industrial need and to pursue further education.

PEO 7: Apply the knowledge of molecular biology, genetics, microbiology, Biochemistry and bioinformatics to derive a solution of complex biotechnological problems.

PROGRAMME OUTCOMES (PO)

PO 1: Identify, analyse and understand the problems related to life sciences and find valid conclusions with basic knowledge acquired in Biotechnology.

PO 2: Effectively communicate the biotechnological information in writing and oral presentation.

PO 3: Understand modern microbiology - practices and approaches with an emphasis in technology application in pharmaceutical, medical, industrial, environmental and agricultural areas.

PO 4: Design and develop solution to major environmental problems by applying modern biotechnological tools while keeping in mind the safety factors for environment and society.

PO 6: Gain experience in Experimental or Case Study design, Scientific Data Analysis, Writing and Communication, Ethical Practices and Effective Collaboration.

PO 7: Impart skills in international teamwork and research collaboration.

PO 8: Build Knowledge of Current industrial practice including Biotechnology Innovations and Molecular Biological Techniques.

PO 9: Become familiar with public policy, bio-safety, and intellectual property rights issues related to microbiology applications nationally and globally

PO 10: Gain experience with standard molecular tools and approaches utilized: manipulate genes, gene products and organisms.

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PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Empower the students to acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology.

PSO 2: Students are able to learn the modern molecular biological techniques viz, chromatography, SDS-PAGE, Agarose Gel Electrophoresis, fermentation, downstream processing and PCR which are very much required for the large-scale production of biotechnology derived products.

PSO 3: Students acquire knowledge required for the production of Antibiotics, Vitamins, Hormones, enzymes, proteins and manufacturing industrially important secondary metabolites through fermentation process.

PSO 4: Recognize the importance of IPR, TRIPS, GATT, PATENT, Bioethics, Entrepreneurship, communication and management skills so as to prepare the next generation of Indian Industrialist.

PSO 5: Graduates will be able to justify health safety and legal issues and understand the biotechnological principles behind.

PSO 6: Students will be able to demonstrate their ability to apply biotechnological research strategies to solve the global environmental problems like climate change, Acid rain, ozone depletion, industrial waste treatment and bioremediation.

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Nal

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Arjuna *[Handwritten signature]*

Vishal

RAMA UNIVERSITY, KANPUR

Ordinances for

Bachelor of Science (Hons.) Biotechnology

[Approved by Academic Council in its meeting dated / /2014 and by

Executive Council in its meeting dated / /2014]

1. Admission

- 1.1. Admission to B.Sc. (Hons.) Biotechnology First year in Ist semester will be made as per the rules prescribed by the Academic Council of the Rama University, Kanpur.
- 1.2. Admission on migration of a candidate from any other University to the University is permitted.

2. Eligibility for Admissions:

2.1. Admission to B.Sc. (Hons.)Biotechnology First Year:

Candidates who have passed Intermediate of U.P. Board or (10+2) standard from other board with Physics and Chemistry as compulsory subject along with one of the following subjects:- Bio-Technology /Biology are eligible for admission to first year of 3 year B.Sc. (Hons.) Biotechnology. Courses offered by Faculty Sciences affiliated to Rama University, Kanpur.

3. Attendance

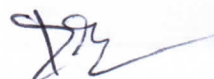
- 3.1 Every student is required to attend all the lectures, tutorials, practicals and other prescribed curricular and co-curricular activities. The attendance can be condoned up to 25% on medical grounds or for other genuine reasons beyond the control of students.
- 3.2 A further relaxation of attendance up to 15% for a student can be given by Dean provided that he/she has been absent with prior permission of the Head of Department for the reasons acceptable to him.
- 3.3 No student will be allowed to appear in the end semester examination if he / she do not satisfy the overall average attendance requirements of Clause Nos. 3.1, and 3.2. and such

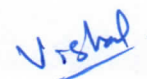










candidate(s) shall be treated as having failed and will be further governed by clause no. 4.1 & 4.2.

3.4 The attendance shall be counted from the date of admission in the college or start of academic session whichever is later.

4. Duration of Courses

4.1 Total duration of the B.Sc. (Hons) Biotechnology Course shall be 3 years, each year comprising of two semesters. Each semester shall normally have teaching for the 90 working days or as prescribed by UGC from time to time.

4.2 A candidate, who has failed twice in first year due to any reason (either due to his/her non-appearance or he/she being not permitted to appear in semester examinations) shall not be allowed to continue his/her studies further subject to clause 9.

5. Curriculum:

5.1 The 3 year curriculum has been divided into 6 semesters and shall include lectures, tutorials, practicals, seminars and projects etc. in addition to industrial training and educational tour etc. as defined in the scheme and executive instructions issued by the University from time to time.

5.2 The curriculum will also include such other curricular, co-curricular and extra- curricular activities as may be prescribed by the University from time to time.

6. Examination:

6.1 The performance of a student in a semester shall be evaluated through continuous evaluation and end semester examination. The continuous evaluation shall be based on Mid Term Examination, assignments/tutorials, quizzes/viva-voce and attendance. The marks for continuous evaluation (Sessional marks) shall be awarded at the end of the semester. The end semester examination shall be comprised of written papers, practicals and viva-voce, inspection of certified course work in classes and laboratories, project work, design reports or by means of any combination of these methods.

6.2 The distribution of marks for sessional, end semester theory papers, practicals and other examinations, seminar, project, industrial training shall be as prescribed.

6.3 The marks obtained in a subject shall consist of marks allotted in end semester theory paper, practical examination and sessional work.

6.4 The minimum pass marks in each theory subject (including sessional marks) shall be 40% with a minimum of 30% marks in each theory paper in the end semester examination. If there is no provision of sessional marks in any subject, the minimum pass marks in that subject shall be 30% in the end semester examination.

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6.5 The minimum pass marks in a project/practical subject (including sessional marks if any) shall be 50%.

6.6 A candidate, in order to pass, must secure 50% marks in the aggregate in a particular academic year inclusive of both semesters of the academic year subjected to conditions as clause 8.2(a).

6.7 The minimum pass marks in Seminar, Industrial Training and Educational Tour, Viva-Voice etc shall be 50%.

7. Promotion:

7.1 A candidate satisfying all the requirements under clause 7 shall be promoted to the next academic year of study.

7.2. (a) A candidate shall be eligible for provisional promotion to the next academic year of study provided :

(i) He/she fails to satisfy the requirements of clause 6.4, 6.5 and 6.7 in not more than 6 theory subject and 2 practical/ project subjects on the basis of combined result of both semester examinations of a particular academic year.

(ii) He/she fails to satisfy the requirements of clause 6.4, 6.5 and 6.7 (theory and/or practical/ project subjects) in not more than 6 theory subjects and 2 practical/project subjects in addition he/she fails to satisfy requirement of clause 6.6 (aggregate marks) in the combined result of both semester examinations of a particular academic year. In such a case aggregate marks shall be treated as one theory subject.

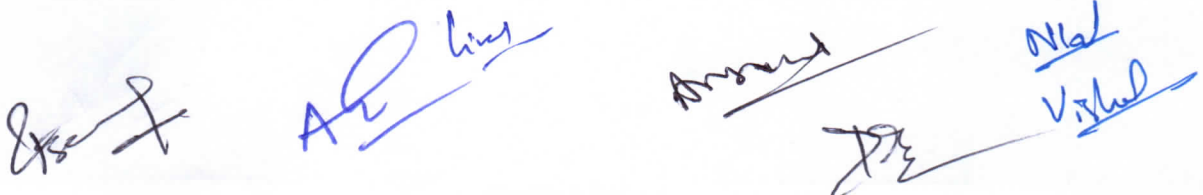
(b) If a candidate satisfies the requirement of clauses 6.4, 6.5 & 6.7 but fails to satisfy the requirement of clause 6.6, he/she shall be eligible for provisional promotion with carry over. He/she may choose upto a maximum of any four theory papers of that particular academic year as per his/her choice to pass the examination of that year.

7.3 A candidate shall not be promoted to third year unless he/she passes all the subjects of first year. Similarly, a candidate shall not be promoted to fourth year unless he/she passes all the examinations of second year.

7.4 All other candidates who do not satisfy conditions laid down in clause 7 shall be declared fail and shall be required to repeat the whole academic year after taking re- admission. This facility is, however, subject to the time limits stipulated in clause-4.

8. Carryover System:

8.1 (a) A candidate who satisfies the requirements of clause 7.2 (a) will be required to appear in those theory papers / practicals in which he/she failed. However, a

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candidate of first year will be allowed to appear in the second semester examination in those theory/ practical subjects in which he/she failed in the first semester examination, provided examination of those theory/practical subjects are held in second semester.

- (b) A candidate satisfying clause 7.2 (b) shall be required to exercise his/her choice up to a maximum of Six theory papers in which he/she desires to appear in the examination to fulfill the requirements of clause 6.6. He/she shall inform the college about his/her choice within 15 days after the start of new session.

8.2 The highest marks secured in any subject in various attempts (end semester and carryover examinations) shall be considered.

9. Ex-studentship:

9.1A candidate opting for ex-studentship shall be required to appear in all the theory & practical subjects in the end semester examinations of both semesters of the same academic year. However, the marks pertaining to Sessional, Industrial Training, and Seminar shall remain the same as those secured earlier.

9.2A candidate opting for ex-studentship shall be required to apply to the faculty of Sciences by paying only examination fee within 15 days from the start of new session.

10. Re-admission:

A candidate may be allowed for re-admission provided he/she satisfies one of the following conditions:

10.1 A candidate is declared fail.

10.2 A candidate did not appear in a semester examination / or he/she was not granted permission to appear in the examination.

10.3 A candidate has been detained by the department and subsequently has been permitted to take re-admission.

10.4 A candidate as an ex-student passed the examination of the academic year or qualified for carryover system.

10.5 A candidate promoted with carry over subjects and he/she opted for re- admission.

11. Results:

11.1 The result of a candidate shall be declared on the basis of performance of both semesters of the same academic year. However, a final year student, who is not permitted in any one of the final year semester examinations due to shortage of attendance, will be



permitted in that particular semester of the next academic session to study as a regular student and appear at that semester examination.

12. Award of Division: The division shall be awarded on the basis of final year result.

12.1 Calculation of Grade Point and Grade Point Average

Relative grading shall be adopted at the Faculty of Engineering & Technology, Rama University.

The list of letter grades, the grade points associated with them are given below:

Grade	Grade Point
A ⁺	10
A	9
B	8
C	7
D	6
E	5
F	4

In order to arrive at alphabet grades, the total marks in a particular course for all the students pursuing the course are tabulated in the descending order (equivalently a histogram).

The performance of the course is analyzed in terms of the highest, lowest and the average marks and the dividing lines between the clusters of students. Gaps and dips between the clusters and the nature of the clusters guide in drawing the dividing lines between the grades. In a normal class of large size, the C grade usually covers the average performance. This is, however not a hard and fast rule and exceptions may arise in case of small classes, skewed histogram etc. Borderline cases may be considered individually on the basis of regularity and the attendance, class room discussions, progressive good performance throughout the semester, etc.

12.2 Calculation System of Semester Grade Point Average:

- Computation of the Semester Grade Point Average (SGPA) and Cumulative Performance Index (CPI):

The SGPA is an indicator of the overall academic performance of a student in all the courses he/she has registered during a given semester. It is computed as follows: If the grades awarded to a student are G_1, G_2 etc in courses with corresponding credits C_1, C_2 etc, the SGPA is given by:

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$$SGPA = \frac{C_1 \times G_1 + C_2 \times G_2 + \dots + C_n \times G_n}{C_1 + C_2 + \dots + C_n}$$

- The CPI indicates the overall academic performance of a student in all the courses registered up to and including the latest completed semester/summer term. It is computed in the same manner as the SGPA, considering all the courses (say, n) and is given by:

$$CPI = \frac{\sum_{i=1}^n C_i \times G_i}{\sum_{i=1}^n C_i}$$

- Percentage conversion of CPI :

$$\text{Percentage of marks} = CPI \times 10$$

- Students should get a minimum grade E in each subject with 5CPI to clear the semester.
- CPI conversion

≥ 8 CPI	Ist division with honours
≥ 6 CPI	Ist division
≥ 5 CPI	IInd division
< 5 CPI	Fail

12.3 If a candidate passes all examinations in first attempt without grace and secures 8CPI or more marks, he/she shall be placed in FIRST DIVISION WITH HONOURS and the candidates at first two top positions amongst First Div. with Honours only will be awarded medals viz. Gold and Silver respectively in order of merit.

13. Award of Rank:

On the basis of final year result, the top ten candidates in each branch shall be awarded rank according to their merit provided they pass all the examinations in first attempt.

14. Grace Marks:

14.1 A candidate may be awarded grace marks up to a maximum of total 15 marks, in maximum five subjects but not more than three marks in any subject including theory papers, practicals, project, seminar, industrial training and/ or aggregate marks in each academic year provided he/she can be declared to have passed the academic year by the award of these marks.

14.2 The grace marks shall not be added to the aggregate marks.



15. Scrutiny and Revaluation:

15.1 Scrutiny shall be allowed in three theory papers.

15.2 Revaluation of theory/practical papers is not permitted.

16. Unfair means:

Cases of unfair means shall be dealt as per the rules of the University and The U.P. Public Examination (Prevention of Unfair means) Act if any in prevalence.

17. Award of Sessional Marks:

Sessional marks for theory subjects, practicals and project shall be awarded as will be prescribed and at present the break-up of sessional marks shall be as follows:

Evaluation Scheme:

- **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

- **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Make-up test may be held only for those students who could not appear in any one of mid-term class tests due to genuine reasons for which the prior permission from the Head of Department was taken. Make up test shall ordinarily be held about two weeks before the semester examination. The syllabus for the make-up test shall be the whole syllabus covered by the subject teacher up to that time.

18. Award of Seminar, Industrial Training, Educational Tour Marks at Department level:

18.1 The marks Mini Project Report shall be awarded on the following basis

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Criteria	Internal	External	Total
Project Report	50	100	150
Viva Voce	50	100	150
Total	100	200	300

The marks of Seminar, Major project shall be awarded on the following basis:

Criteria	Internal	External	Total
Project Report	50	150	200
Viva Voce	50	100	150
Total	100	250	350

18.3 The marks in Seminar, Industrial Training and Educational Tour shall be awarded by a committee consisting of following members:

- (i) Head of the Department or his/her nominee.
- (ii) Concerned Officer – In-charge.
- (iii) Senior Faculty Member of the department nominated by the Head of Department.

19. Cancellation of Admission:

The admission of a student at any stage of study shall be cancelled if:

- (i) He / She is not found qualified as per UGC/AICTE / State Government norms and guidelines or the eligibility criteria prescribed by the University.

or

- (ii) He / She is found unable to complete the course within the stipulated time as prescribed in clause 4.2

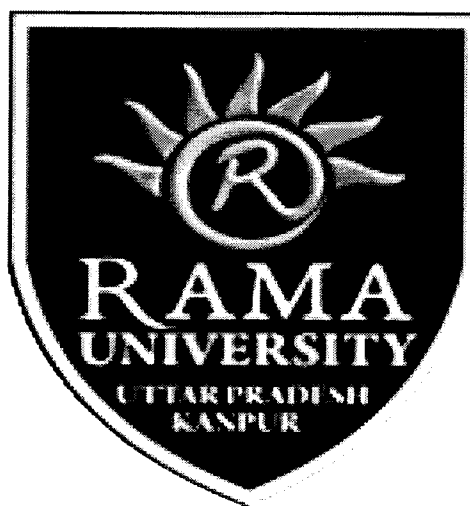
or

- (iii) He / She are found involved in creating indiscipline in the Faculty of Sciences or in the University.

20. The Academic Council shall have the power to relax any provision provided in the ordinance in any specific matter/situation subject to the approval of Executive Council of the University & such decision(s) shall be reported to the Chancellor of the University.

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Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



EVALUATION SCHEME

B. Sc. (Hons.) Biotechnology

[Effective from the Session 2017-18]

1st, 2nd, & 3rd Year

Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks


Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1. 

Name: Dr. Vivek Srivastava

Date:

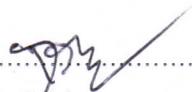
Signature: 2. 

Name: Er. Anjani Kumar Srivastava

Signature: 3. 

Name: Mrs. Rati Bajpai

Date:

Signature: 4. 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1. 

Name: Prof. Nand Lal

Date:

Signature: 2. 

Name: Er. Vishal Kumar Srivastava

Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology

First Year- 1st Semester

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-111	Chemistry-I	3	1	0	20	20	60	100	4
2	BBS-112	Fundamentals of Physics	3	1	0	20	20	60	100	4
3	BBS-113	Professional Communication	3	1	0	20	20	60	100	4
4	BBS-114	Cell Biology	3	1	0	20	20	60	100	4
5	BBS-115	Microbiology	3	1	0	20	20	60	100	4
Practical's / Project										
6	BBS-161	Chemistry Lab	0	0	2	30	20	50	100	2
7	BBS-162	Cell & Microbiology Lab	0	0	2	30	20	50	100	2
		Total	15	5	4	160	140	400	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

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Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology

First Year- 2nd Semester

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-211	Chemistry-II	3	1	0	20	20	60	100	4
2	BBS-212	Biochemistry	3	1	0	20	20	60	100	4
3	BBS-213	Computer fundamental and office automation	3	1	0	20	20	60	100	4
4	BBS-214	Elementary Mathematics	3	1	0	20	20	60	100	4
5	BBS-215	Biophysical tools & Techniques	3	1	0	20	20	60	100	4
Practicals / Project										
6	BBS-261	Biochemistry Lab	0	0	2	30	20	50	100	2
7	BBS-262	Computer Fundamental Lab	0	0	2	30	20	50	100	2
		Total	15	5	4	160	140	400	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project : 15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1. 

Name: Dr. Vivek Srivastava

Date:

Signature: 2. 

Name: Er. Anjani Kumar Srivastava

Signature: 3. 

Name: Mrs. Rati Bajpai

Date:

Signature: 4. 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1. 

Name: Prof. Nand Lal

Date:

Signature: 2. 

Name: Er. Vishal Kumar Srivastava

Rama University Uttar Pradesh, Kanpur
Faculty of Sciences



Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology
Second Year- 3rd Semester

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-311	Enzymology	3	1	0	20	20	60	100	4
2	BBS-312	Plant Physiology	3	1	0	20	20	60	100	4
3	BBS-313	Animal Physiology	3	1	0	20	20	60	100	4
4	BBS-314	Genetics	3	1	0	20	20	60	100	4
5	BBS-315	Plant Biotechnology	3	1	0	20	20	60	100	4
Practicals / Project										
6	BBS-361	Enzymology Lab	0	0	2	30	20	50	100	2
7	BBS-362	Plant Biotechnology Lab	0	0	2	30	20	50	100	2
		Total	15	5	4	160	140	400	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

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MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1. 

Name: Dr. Vivek Srivastava

Date:

Signature: 2. 

Name: Er. Anjani Kumar Srivastava

Signature: 1. 

Name: Mrs. Rati Bajpai

Date:

Signature: 2. 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1. 

Name: Prof. Nand Lal

Date:

Signature: 2. 

Name: Er. Vishal Kumar Srivastava

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Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology
Second Year- 4th Semester

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-411	Molecular Biology	3	1	0	20	20	60	100	4
2	BBS-412	Animal Biotechnology	3	1	0	20	20	60	100	4
3	BBS-413	Biostatistics	3	1	0	20	20	60	100	4
4	BBS-414	Bioinformatics	3	1	0	20	20	60	100	4
5	BBS-415	Ethics, Patenting and Bio-Entrepreneurship	3	1	0	20	20	60	100	4
Practicals / Project										
6	BBS-461	Molecular Biology Lab.	0	0	2	30	20	50	100	2
7	BBS-462	Bioinformatics Lab	0	0	2	30	20	50	100	2
Total			15	5	4	160	140	400	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

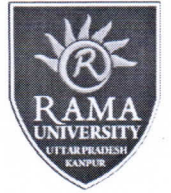
- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

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Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks


Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1. 

Name: Dr. Vivek Srivastava

Date:

Signature: 2. 

Name: Er. Anjani Kumar Srivastava

Signature: 3. 

Name: Mrs. Rati Bajpai

Date:

Signature: 4. 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1. 

Name: Prof. Nand Lal

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Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology
Third Year- 5th Semester

S.N.	Subject Code	Subject Name	Period			Evaluation Scheme			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-511	Genetic Engineering	3	1	0	20	20	60	100	4
2	BBS-512	Environmental Science	3	1	0	20	20	60	100	4
3	BBS-513	Immunology	3	1	0	20	20	60	100	4
Practicals / Project										
4	BBS-561	Immunology Lab	0	0	2	30	20	50	100	2
5	BBS-562	Mini Project Work and Presentation	0	0	10	100	-	200	300	10
Total			9	3	12	190	80	430	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term

Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

3. Attendance: 5 Marks
4. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 50 Marks

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Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1..... 

Name: Dr. Vivek Srivastava

Date:

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Name: Er. Anjani Kumar Srivastava

Signature: 3..... 

Name: Mrs. Rati Bajpai

Date:

Signature: 4..... 

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Date:

Signature: 2..... 

Name: Er. Vishal Kumar Srivastava

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Course Detail and Evaluation Scheme
(Effective from the Session 2017-18)

B.Sc. (Hons.) Biotechnology
Third Year- 6th Semester

S.N.	Subject Code	Subject Name	Period			EVALUATION SCHEME			Subject Total	Credit
			L	T	P	CE	MTE	ETE		
Theory subjects										
1	BBS-611	Industrial Biotechnology	3	1	0	20	20	60	100	4
2	BBS-612	Nanobiotechnology	3	1	0	20	20	60	100	4
Practicals / Project										
3	BBS-661	Major Project Work and Presentation	0	0	12	100	-	250	350	12
4	BBS-662	Seminar	0	0	2	50	-	100	150	4
Total			6	2	14	190	40	470	700	24

L-Lecture, T-Tutorial, P- Practical, CE- Continuous Evaluation, MTE-Mid Term Examination, ETE-End Term Examination

Evaluation Scheme:

• **Course without practical components**

For Continuous Evaluation (CE) is such as: 20 Marks

1. Attendance: 5 Marks
2. Assignments/Quiz / Seminar/Term paper /Project :15Marks

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

ETE - End Term Examination: 60 Marks

• **Course with practical components only**

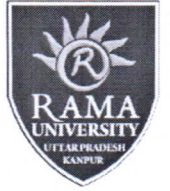
For Continuous Evaluation (CE) is such as: 30 Marks

Conduct / Perform/Execution /Practical File/ Viva-Voice

MTE - Mid Term Examination: 20 Marks

- a. First Mid Term Examination: 10 marks
- b. Second Mid Term Examination: 10 marks

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ETE - End Term Examination: 50 Marks


Convener

Signature: 

Name : Dr. Ajay Kumar


Date :

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Signature: 1. 

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Date:

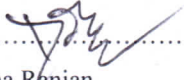
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External Members

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Date:

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First year-1st Semester
BBS-111: Chemistry I

LT P
3 1 0

Credit: 4

OBJECTIVE:

- To understand basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.

OUTCOMES: At the end of the course, the student will be able to:

- Understand the concepts of structure and bonding in organic molecules
- Acquire basic knowledge of organic chemistry and apply the concepts of organic chemistry for synthesis
- Understand the basic principles of stereochemistry.
- Understand the nomenclature, Classification, isomerism, synthesis and properties of alkanes and cycloalkanes
- Understand the nomenclature, Classification, isomerism, synthesis and properties of alcohols

CONTENT:

Unit 1: Structure and Bonding:

8 Hours

Hybridizations, Bond lengths and bond angles, bond energy, Electron displacement in organic chemistry (resonance, hyperconjugation, inductive and field effects), types of hydrogen bonding.

Unit 2: Types of Reagents and Reactions:

8 Hours

Electrophiles and nucleophiles. Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Types of organic reactions special reference of nucleophilic substitution reaction.

Unit 3: Stereochemistry:

8 Hours

Conformations w.r.t. ethane, butane and cyclohexane; Concept of chirality; Enantiomerism, Diastereomerism, R-S & E-Z nomenclature.

Unit 4: Alkanes:

8 Hours

IUPAC nomenclature, classification, isomerism in alkanes, sources, and methods of preparation (with

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special reference to Wurtz, Kolbe, Corey-House reactions and decarboxylation). Physical and chemical properties of alkanes. Mechanism of free radical halogenation of alkanes. Cycloalkanes: Nomenclature, methods of preparations, chemical reactions. Bayer's strain theory and its limitations. ring strain in cyclopropane and cyclobutanes. Theory of strain in rings.

Unit 5: Alcohols:

8 Hours

Preparation of primary alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters, Reactions with sodium, HX (Lucas test), etherification, oxidation (with alk. KMnO_4 , acidic dichromate, conc. HNO_3). Oppeneauer oxidation; Diols: oxidation of diols. Pinacol-Pinacolone rearrangement.

Text/Reference Books

1. R. T. Morrison & R. N. Boyd: Organic Chemistry, Prentice Hall.
2. Arun Bahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand
3. A.I. Vogel, Textbook of Practical Organic Chemistry, Prentice Hall, 5Th edition.

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BBS-112: Fundamentals of Physics

L T P

Credit: 4

3 1 0

OBJECTIVES:

- The students will introduce about the elasticity, Surface tension and knowledge about the Constraint
- The course will give knowledge about the general parameter like Viscosity, Poiseulles equation.
- The course provides the students about the knowledge of laser applications, Fiber Optics.
- The course provides the students about the knowledge of thermodynamics and semiconductor.

OUTCOMES:

- Get the knowledge about elasticity helps the students in their daily life.
- The Viscosity, Poiseulles equation parameter give the knowledge about how the liquid flow.
- The information will teach the students about the concept of flow of liquid.

CONTENT:

Unit 1:

8 Hours

Elasticity: Stress and strain in solids; Hook's law; Stress-strain curves; Limit of elasticity; Relevance of elasticity to life sciences; Surface tension: Surface tension and surface energy: Definition, concept and derivation; Capillary action; Angle of contact; Temperature dependence of surface tension.

Unit 2:

8 Hours

Fluid Statics & Fluid Dynamics: Stream line and turbulent flow of liquids, Viscosity, coefficient of viscosity, stokes law, Terminal velocity The variation of pressure in a fluid at rest, Flow of liquids through capillaries, Poiseulles equation, Derivations and physical significance.

Unit 3:

8 Hours

Modern Optics Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications. Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone,

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Numerical aperture, Single and Multi Mode Fibers.

Unit 4:

8 Hours

Thermodynamics: First law of thermodynamics- Mathematical form, applications, Indicator diagram and concept of cyclic process; Second law of thermodynamics- Concept of entropy with examples; Carnot cycle and its efficiency, Degrees of freedom.

Unit 5:

8 Hours

Semi conductors: conductor, insulator, semiconductor, intrinsic and extrinsic semiconductors, p-n junction diode, half wave rectifier and full wave rectifier, p-n-p transistor and n-p-n Transistor, transistor as an amplifier, Light Emitting diode.

Text/Reference Books

1. David Hallday and Robert Resnick, Physics - (Vol. I and II) Willey Eastern Ltd.
- 2 S.K. Saxena ,Fundamentals of mechanics - Himalaya Publication
- 3 Arthur Beiser, Perspectives of modern physics - Mc Graw Hill
- 4 Zemansky Heat and thermodynamics - Mc Graw Hill
5. Principle of electronics –V.K.Mehta

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BBS-113: Professional Communication

L T P

Credit: 4

3 1 0

OBJECTIVES:

- Educate students to be problem solvers who are especially strong in oral and written communication.
- Encourage students' analytical and creative skills in order that they will be prepared to address a wide variety of challenges in their professional lives.
- Prepare students for lifelong productive careers which may include graduate studies, communication professions or corporate leadership.

OUTCOMES:

- Students should become adept in their use of the spoken word in interpersonal communication, small group interactions and public speaking.
- Students should have conducted original research involving literature review, research design and implementation including appropriate application of data analysis tools.
- Students should demonstrate the ability to apply rhetorical principles in a variety of creative, cinematic, organizational, professional and journalistic venues.

CONTENT:

Unit 1:

8 Hours

Fundamentals of communication Technical Communication: Features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral or Horizontal (peer group); Importance of technical communication; Barriers to Communication.

Unit 2:

8 Hours

Writing correct English The Sentence: Meaning and definition, Kinds of Sentences; Tenses; Present, Past and Future; Concord: Meaning; Concord of Numbers and Persons; Articles.

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Unit 3:

8 Hours

Constituents of technical written communication Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500- 1000 new words; Correct Usage; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc.;

Unit 4:

8 Hours

Business communication Principles. Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal and its Significance.

Unit 5:

8 Hours

Presentation strategies and speech mechanism Defining Purpose; Audience and Locale, Organizing Contents; Preparing Outline; Audio-Visual Aida; Nuance of Delivery; Body Language; Dimensions of Speech; Syllable; Accent Pitch; Rhythm; Intonation; Difference between stress and intonation; paralinguistic features of voice.

Text/Reference Books:

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice., Oxford University Press, New Delhi.
2. Dr. Malti Agarwal, Professional Communication., Krishna Prakashan Media (P) Ltd., Meerut.
3. Gerson, Sharon J. & Gerson, Steven M., Technical Writing- Process and Product , Delhi, Pearson/ Education Publications.
4. Sinha, R.P., English Grammar and Usage, New Delhi, Oxford University Press. Lewis, Norman, Word Power Made Easy, Delhi, W.R. Goyal Pub.& Distributors.

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BBS-114: Cell Biology

L T P

Credit: 4

3 1 0

OBJECTIVE:

Cell biology is the study of cell structure and function, and it revolves around the concept that the cell is the fundamental unit of life. Focusing on the cell permits a detailed understanding of the tissues and organisms that cells compose. The study of cells is called cell biology.

OUTCOME:

Cells are the basic unit of life probably study of cell biology is very important. Many diseases and disorders are as a result of issues at a cell or molecular stage. The cell (from Latin cella, meaning "small room") is the basic structural, functional, and biological unit of all known living organisms, known as "building blocks of life".

CONTENTS:

Unit 1:

8 Hours

The Cell: Prokaryotic and Eukaryotic cell, Cell theory, detailed account on prokaryotic & eukaryotic cell. Differences between animal and plant cell.

Unit 2:

8 Hours

The structure of cellular organelles: Plasma membrane, cell wall, cytoskeleton their structural organization and extra cellular matrix .Mitochondria, chloroplast, ribosome's , lysosome , nucleus, and other organelles and their organization.

Unit 3:

8 Hours

Biological membranes- Physicochemical properties of cell membranes and their structural constitution. Transport of nutrients across the membranes - simple, passive, facilitated diffusion.

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Unit 4:

8 Hours

Cellular responses to environmental signals in bacteria, plants and animals-mechanism of signal transduction . Cell cycle – molecular events and regulation, Cell division (mitosis& meiosis).

Unit 5:

8 Hours

Cellular Basis of differentiation and development – cell division, gametogenesis and fertilization, embryonic development in Drosophilla.

Text/Reference Books:

1. Lodish et al., Molecular cell Biology, 4th Edition, W.H. Freeman & Company, 2000.
2. Smith & Wood, Cell Biology, 2nd Edition, Chapman & Hall, London, 1996.
3. Watson et al., Molecular Biology of the gene,5th Edition, Pearson Prentice Hall. USA, 2003.
4. B. M. Turner, Chromatin & Gene regulation, 1st Edition, Wiley-Blackwell, 2002.
5. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers, 2007.

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D.M.

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Anand, Lal, Alkal, Vimal



BBS-115: Microbiology

L T P

Credit: 4

3 1 0

OBJECTIVE:

Microbiology is the study of microscopic organisms, such as bacteria, viruses, archaea, fungi and protozoa. This discipline includes fundamental research on the biochemistry, physiology, cell biology, ecology, evolution and clinical aspects of microorganisms, including the host response to these agents.

OUTCOME:

The physiology, biochemistry, and genetics of microorganisms, including such topics as structure, function, diversity, metabolism, and the genetics of metabolic regulation. While some fear microbes due to the association of some microbes with various human diseases, many microbes are also responsible for numerous beneficial processes such as industrial fermentation (e.g. the production of alcohol, vinegar, dairy products, antibiotic production and act as molecular vehicles to transfer DNA to complex organisms.

CONTENTS:

Unit 1:

8 Hours

Introduction to Microbiology: History, scope and development of Microbiology; Applications of Microbiology in human welfare. Development of Microbiology in India: Antony van Leeuwenhoek, Alexander Fleming, Edward Jenner, Louis Pasteur, Robert Koch, Selman Waksman, Joseph Lister, A M Chakraborti etc.

Unit 2:

8 Hours

Culture techniques, Physical and chemical methods of sterilization. Diversity of Microbial World: Classification, general characteristics and structure of Bacteria-(eubacteria & archaebacteria), Cyanobacteria, Actinomycetes, Mycoplasma.

Unit 3:

8 Hours

Diversity of Microbial World: Classification, general characteristics, structure with emphasis on Mucor, Rhizopus, Puccinia, Cercospora, Aspergillus, Penicillium Alternaria, function of each part & components of cell. Reproduction & economic importance of Fungi.

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Unit 4:

8 Hours

Diversity of Microbial World: Classification, general characteristics and structure of Viruses (Prions, Virions, Virusoids & Viroids) Virus host, General features of virus reproduction. DNA & RNA Viruses with the example of T4, TMV & Pox Virus.

Unit 5:

8 Hours

Growth and growth measurement: Definition of growth, mathematical expression of growth. Growthcurve, Growth yield, Effect of nutrient concentration on growth. Factors affecting growth: nutrients, temperature, oxygen, pH, osmotic pressure.

Text/Reference Books

1. Pelczar MJ Jr., Chan ECS and Kreig NR., Microbiology, 5th Edition, Tata McGraw Hill, 1993.
2. Maloy SR, Cronan JE Jr., and Freifelder D, Microbial Genetics, Jones Bartlett Publishers, Sudbury, Massachusetts, 2006.
3. Crueger and A Crueger, (English Ed., TDW Brock); Biotechnology: A textbook of Industrial Microbiology, Sinauer Associates, 1990.
4. G Reed, Prescott and Dunn's, Industrial Microbiology, 4th Edition, CBS Publishers, 1987.
5. M.T. Madigan and J.M. Martinko, Biology of Microorganisms, 11th Edition, Pearson Prentice Hall, USA, 2006

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BBS-162 : Cell Biology Microbiology Lab

L T P

Credit: 1

0 0 2

1. Identification and staining of different types of cells.
2. Measurement of various Cell Organelles.
3. Lipid Solubility of Membranes.
4. Determination of Osmosis
5. Determination of Pinocytosis process
6. Isolation of Chloroplasts from spinach Leaves.
7. Detection of Mitosis with the help of microscope.
8. Sterilization, disinfection, safety in microbiological laboratory.
9. Preparation of media for growth of various microorganisms.
10. Identification and culturing of various microorganisms.
11. Staining and enumeration of microorganisms.
12. Growth curve, measure of bacterial population by turbidometry and studying the effect of temperature, pH, carbon and nitrogen.

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A.P. ✓
S.S. ✓
D.M. ✓
M. Singh ✓
N.K. ✓
V.S. ✓
K. ✓

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First year - 2nd Semester

BBS-211: Chemistry-II

L T P

Credit: 4

3 1 0

OBJECTIVES:

- To be familiarised with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.

OUTCOMES: At the end of the course, the student will be able to:

- Know about characteristics of gases, various gas laws and comprehensive knowledge of the kinetic theory of gases, ideal and real gas behavior
- Understand the concept of preparing various standard solutions, the colligative properties and also abnormal behaviour of solution
- Gather the knowledge in basic concepts of thermodynamics
- Know the difference between solution, colloid and suspension, different types and properties of colloidal solution

CONTENT:

Unit 1:

8 Hours

General characteristic of gases, gas law, Boyle's law, Charles's law, Gay-Lussac's law, the gas equation, Avogadro's hypothesis, mole concept, Dalton law of partial pressure, Graham's law of diffusion, kinetic molecular theory of gases, ideal and real gases.

Unit 2:

8 Hours

Solution, concentration of solution, normality, equivalent weight, molarity, formality, molality, solutions of gases in gases, mole fraction, Grams per ml, colligative properties, abnormal behavior of solutions, Vant Hoff factor.

Unit 3:

8 Hours

Rate, order and molecularity of reaction, Integrated rate equation of zero order, first order and second order reactions, activation energy. Electrolysis, electrochemical cells, electrode potential,

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electrochemical series, electrode potentials and electrolyte concentration.

Unit 4:

8 Hours

Thermodynamics: Types of thermodynamic systems, equilibrium and nonequilibrium state, reversible and irreversible process, Nature of heat and work, internal energy, First law of thermodynamics, thermochemistry, enthalpy of reactions.

Unit 5:

8 Hours

True solution, colloidal solution and suspension, types of colloidal systems, classification of colloids, properties of colloidal system, co-agulation of colloidal solution, protective colloids, Phase Rule and its application to one component system (water).

Text/Reference Books

1. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 8th Ed., Oxford University Press, 2006.
2. Ball, D. W. Physical Chemistry Thomson Press, India, 2007.
3. Castellan, G. W. Physical Chemistry, 4th Ed. Narosa, 2004.
4. Mortimer, R. G. Physical Chemistry, 3rd Ed. Elsevier, 2009

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BBS-212: Biochemistry

L T P

Credit: 4

3 1 0

OBJECTIVE:

The processes and substances with which the science of biochemistry is concerned. It is a description: A program that focuses on the scientific study of the chemistry of living systems, their fundamental chemical substances and reactions, and their chemical pathways and information transfer systems, with particular reference to carbohydrates, proteins, lipids, and nucleic acids.

OUTCOME:

Biochemistry focuses on understanding how biological molecules give rise to the processes that occur within living cells and between cells, which in turn relates greatly to the study and understanding of tissues, organs, and organism structure and function. Biochemistry is closely related to molecular biology, the study of the molecular mechanisms by which genetic information encoded in DNA is able to result in the processes of life.

CONTENTS:

Unit 1:

8 Hours

Water, Structure, unusual properties, non-covalent interactions, role in biological processes. Ionization of Water, pH scale, Weak Acids, and Weak Bases. Buffers and buffering mechanism, Henderson Hasselbalch equation. Buffering against pH Changes in Biological Systems: Phosphate buffer, Bicarbonate buffer, Protein buffer, Amino acid Buffer & Hemoglobin Buffer System.

Unit 2:

8 Hours

Carbohydrates-classification, structure and functions of monosaccharides (Glucose, Fructose, Galactose, Mannose), disaccharides (Maltose, Lactose, Sucrose) and polysaccharides (Starch, Glycogen, Cellulose, Chitin, Heparin). Ring structure and mutarotation, stereo isomers and structural isomers. Metabolism- Glycolysis & oxidation of Pyruvate, TCA cycle.

Unit 3:

8 Hours

Fats and lipids-Classification, structure and function: Simple, Compound & Derived lipids, Essential fatty acids. Fatty acid biosynthesis, origin of acetyl-Co A for fat synthesis, Activation & transport of

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fatty acid from cytosol to mitochondria for oxidation. Elongation & unsaturation of Fatty Acids. Oxidation of saturated fatty acids(β -oxidation.) Formation and utilization of ketone bodies.

Unit 4:

8 Hours

Amino acids and proteins-Classification & structure of amino acids. Essential amino acids. Peptide bond formation, Ramachandran plot, Primary, secondary, tertiary & quaternary structure of proteins. Biosynthesis of amino acids from intermediates of Citric Acid Cycle & other major pathways. Biodegradation of amino acids: Deamination, transamination. Urea Cycle.

Unit 5:

8 Hours

Purines and pyrimidines-Structure and properties. Metabolism of Nucleotides: Purines & Pyrimidines synthesis : de Novo & salvage pathway, Conversion of nucleoside monophosphates to nucleoside triphosphates, Formation of deoxyribonucleotides. Catabolism & salvage of Purine and Pyrimidine nucleotides.

Text/Reference Books:

1. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
2. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.
3. L. Stryer, Biochemistry, 5th edition, W.H. Freeman and Company, 2002.

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BBS-213: Computer Fundamental & Office Automation

L T P

Credit: 4

3 1 0

OBJECTIVE:

- Give students an in-depth understanding of why computers are essential components in business, education and society.
- Provide hands-on use of Microsoft Office

OUTCOMES:

- Describe the usage of computers and why computers are essential components in business and society.
- Solve common business problems using appropriate Information Technology applications and systems.
- Identify categories of programs, system software and applications. Organize and work with files and folders. Describe various types of networks network standards and communication software.

CONTENT:

Unit 1:

8 Hours

Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Mini computers, Micro computers, Mainframe computers, Super Computers. Types of Programming Languages(Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM. Secondary Storage Devices (FD, CD, HD, Pen drive). I/O Devices (Scanners, Plotters, LCD, Plasma Display). Number Systems Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication.

Unit 2:

8 Hours

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples Flowchart: Definition,

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Define symbols of flowchart, Advantages and disadvantages, Examples.

Unit 3:

8 Hours

Dos – History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

Unit 4:

8 Hours

Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

Unit 5:

8 Hours

Editors and Word Processors, Basic Concepts, Examples: MS-Word, Introduction to desktop publishing. Spreadsheets and Database packages, Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

Text/Reference Books:

1. V.Rajaraman Fundamental of Computers , B.P.B. Publications
2. Fundamental of Computers – By P.K. Sinha
3. Computer Today- By Suresh Basandra
4. Unix Concepts and Application – By Sumitabha Das
5. MS-Office 2000(For Windows) – By Steve Sagman

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BBS-214: Elementary Mathematics

L T P

Credit: 4

3 1 0

OBJECTIVE:

- To impart analytical ability in solving mathematical problems as applied to the respective branches of Engineering.
- To improve their ability in solving geometrical applications of differential calculus problems.
- To apply advanced Integration knowledge to Engineering problems.

OUTCOMES: At the end of the course, the student will be able to:

- Determine the Continuity and Differentiability of function.
- Determine the integral of different functions.
- Estimate the maxima and minima of functions.

CONTENT:

Unit 1:

8 Hours

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit 2:

8 Hours

Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential, logarithmic functions and their derivative. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations. Applications of derivatives: rate of change, increasing/decreasing functions, tangents & normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate BBSic principles and understanding of the subject as well as real-life situations).

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Unit 3:

8 Hours

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

Unit 4:

8Hours

Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

Unit 5:

8 Hours

Fundamental principle of counting. Factorial n . ($n!$) Permutations and combinations, derivation of formulae and their connections, simple applications.

Text/Reference Books:

1. Mathematics Part I - Textbook for Class XI, NCERT Publication
2. Mathematics Part II - Textbook for Class XI, NCERT Publication
3. Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill)
4. Advanced modern engineering mathemtics by Glyn james (pearson education)

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BBS-215: Biophysical tools & Techniques

L T P

Credit: 4

3 1 0

OBJECTIVE:

Biophysical methods are techniques to study the structure, properties, dynamics or function of biomolecules at an atomic or molecular level. They encompass a range of techniques including microscopy, spectroscopy, electrophysiology, single-molecule methods and molecular modelling.

OUTCOME:

Molecular biology techniques are common methods used in biochemistry, genetics and biophysics which generally involve manipulation and analysis of DNA, RNA, protein, and lipid.

CONTENTS:

Unit 1:

8 Hours

Microscopy (Principal and application), Light microscopy, Phase contrast microscopy, fluorescence and electron microscopy (TEM and SEM).

Unit 2:

8 Hours

Chromatography technique: Paper chromatography, thin layer chromatography, column chromatography, gas chromatography, affinity chromatography, ion exchange chromatography, gel filtration.

Unit 3:

8 Hours

Electrophoresis: SDS-polyacrylamide gel electrophoresis, agarose gel electrophoresis, isoelectric-focusing immunoelectrophoresis.

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Unit 4:

8 Hours

Instruments, Basic principle and usage: pH meter, absorption and emission spectroscopy, principle and law of absorption and radiation, use of densitometry, fluorimetry, colorimetry, spectrophotometry (UV, visible and IR), manometry, paleography, centrifugation (rpm and G, ultracentrifugation), atomic absorption, IR, NMR, fluorescence, X-ray crystallography.

Unit 5:

8 Hours

Radioisotope tracer technique, importance in biological studies, measures of radioactivity, autoradiography.

Text/Reference Books

1. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H.Freeman & Company, San Fransisco, 1982.
2. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, 2000.
3. D. Holme & H. Peck, Analytical Biochemistry, 3rd Edition, Longman, 1998.
4. R. Scopes, Protein Purification - Principles & Practices, 3rd Edition, Springer Verlag, 1994.

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BBS-263: Computer Fundamental Lab

L T P

Credit: 1

0 0 2

List of experiments

CYCLE-1 (MS-word & MS-EXCEL)

1. Features of office automation.
2. Creating a new document and perform the various formatting operation in MS-Word.
3. Create a mail merge operation using MS-Word.
4. Create a table using MS-Word.
5. Perform the paragraph alignment in MS-Word.
6. Create a work sheet in MS-Excel.
7. Create various charts in MS-Excel.
8. Perform statistical operations in MS-Excel.
9. Perform various text operations in MS-Excel.

CYCLE-II(MS-Access & MS-PowerPoint)

10. Create a mark sheet data base in MS-Access .
 11. Creating a pay-bill database in MS-Access
 11. Update a pay-bill database in MS-Access
 12. Viewing a Pay-bill database in MS-Access.
 13. Generating forms and reports in MS-Access.
 14. Inserting pictures, clipart, audio and video slideshow using MS-PowerPoint.
 15. Customizing Animation using MS-PowerPoint.
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BBS-262: Biochemistry Lab

L T P
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Credit: 1

1. Estimation of Glucose by DNS and Anthrone Method.
2. Estimation of proteins by Lowry and Bradford method.
3. Separation of amino acids/lipids by thin layer chromatography
4. Separation of amino acids by paper chromatography.
5. Estimation of Bilirubin by human serum.
6. Estimation of blood sugar.
7. Estimation of blood urea.
8. Estimation of hemoglobin content of human blood.
9. Determine the number of RBC count in the human blood.
10. Determine the number of WBC count in the human blood.

Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1..... 

Name: Dr. Vivek Srivastava

Date:

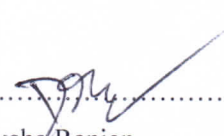
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Er. Anjani Kumar Srivastava

Signature: 3..... 

Name: Mrs. Rati Bajpai

Date:

Signature: 4..... 

Dr. Deeksha Ranjan

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External Members

Signature: 1..... *N Lal* 2..... *V. S. Srivastava*
Name: Prof. Nand Lal Er. Vishal Kumar Srivastava
Date:



Second Year- 3rd Semester
BBS-311: Enzymology

L T P
3 1 0

Credit: 4

OBJECTIVE:

The objective of the course is to provide a deeper insight into the fundamentals of enzyme structure and function and kinetics of soluble and immobilized enzymes. Also it deals with current applications and future potential of enzymes process. The student will be able to perform immobilization of enzymes.

OUTCOME:

Enzymes play a very role in the world. They act as a catalyst for a chemical reaction, whether that reaction involves the execution of DNA for the purpose of cell repair or for the digestion of any types of meat as well as poultry.

CONTENTS:

Unit 1:

8 Hours

Historical perspective, Enzyme Classification. Isolation and Purification of Enzymes, General Properties, Enzyme Activity, Specific Activity and Turnover Number.

Unit 2:

8 Hours

Enzyme Kinetics: Enzyme-Substrate Interaction, ES Complex, Binding Site, Active Site. Specificity, Steady-State, Pre-Steady State and Equilibrium-State Kinetics, Michael- Menten Equation and its derivation, Graphical Methods for determination of K_m , V_{max} . Significance. Enzyme Inhibition and Activation: types of inhibition, and activation, Competitive non-competitive and Uncompetitive inhibitors.

Unit 3:

8 Hours

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Mechanism of Enzyme action: enzyme-substrate complementarity, Interaction between enzyme and substrate- lock and key model, induced fit model. Factors associated with catalytic efficiency., Allosteric enzymes, Proenzymes-Zymogens and activation.

Unit 4:

8 Hours

Enzyme Immobilization: Adsorption, Matrix entrapment, Encapsulation, Cross linking, Covalent binding and their examples; Advantages and disadvantages of different immobilization techniques. Structure & stability of immobilized enzymes, kinetic properties of immobilized enzymes- Overview of applications of immobilized enzyme systems.

Unit 5:

8 Hours

Isoenzyme, Ribozymes, Abzymes. Industrial, Agricultural and Clinical Applications of Enzymes: Comprehensive Account.

Text/Reference Books

- 1 .Nelson, D.L. and Cox, M.M., Lehninger: Principles of Biochemistry, 6thed., W.H. Freeman and Company, New York,2013
2. Donald, V. and Judith G.V., Biochemistry , 4th ed., John Wiley & Sons Asia Pvt. Ltd. , New Jersey , 2011
3. Nicholas C.P. and Lewis S., Fundamentals of Enzymology 3rd ed., Oxford University Press Inc. New York,1999

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BBS-312: Plant Physiology

L T P

Credit: 4

3 1 0

OBJECTIVE:

Plant Physiology is an fundamental subject to know and understand the basic reaction nature and metabolism of plants.

OUTCOME:

Physiology is extremely important this determines how well new cultivars can handle stresses like drought, salinity, heat, etc. Also yield improvements are also tracked in this manner. Plant physiology explains how plants function in all environments.

CONTENTS:

Unit 1:

8 Hours

Plant and water relationship. Water uptake, conduction, transpiration, mechanism and its regulation by environmental variables. Mineral nutrition: Macro, and micronutrients, their role, deficiency and toxicity symptoms, plant culture practices, mechanism of ion uptake and translocation.

Unit 2:

8 Hours

Photosynthesis and Chemosynthesis: photosynthetic pigments, O₂ evolution, photophosphorylation, CO₂ fixation - C₃- C₄ and CAM plants.

Unit 3:

8 Hours

Respiration : aerobic and anaerobic respiration, respiratory pathways glycolysis, krebs 'cycle, electron transport, oxidative phosphorylation, pentose phosphate pathway, photorespiration, cyanide resistant respiration.

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Unit 4:

8 Hours

Growth: general aspects of phytohormones, inhibitors-auxins. kinetin, gibberellins, and ethylene: action and their application; photoperiodism and vernalization. Germination, growth movements, parthenocarpy, abscission and senescence.

Unit 5:

8 Hours

Nitrogen metabolism: atmospheric nitrogen fixation, *nif*-gene & its role, nitrogen cycle, nitrogen assimilation,

Text/Reference Books

1. Bidwell .R.G.S. Plant Physiology. Macmillan. Publication Co. Newyork, 1974.
2. Ting. I.P. Plant Physiology. Addison Wesley Publication Co. Philippines, 1982.
3. Conn. E.E.; P.K. Stumps; G. Brueming and Doi. R.G.. Outlines of Biochemistry. John wiley & Co. Newyork, 1987

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BBS-313: Animal Physiology

L T P

Credit: 4

3 1 0

OBJECTIVE:

To familiarize students for cellular and molecular mechanisms to understand about nervous, muscular, cardiovascular, respiratory, renal, digestive, and endocrine physiology.

OUTCOME:

An understanding of animal anatomy and physiology is important for people working in a range of industries, especially those working with livestock, domestic pets and wildlife. Structure anatomy deals with the different parts of the animal body, such as; cells, tissues, bone, and muscle.

CONTENTS:

Unit 1:

8 Hours

Digestion: Introduction & component of Human digestive system, digestive enzymes, process of digestion, digestion of protein, carbohydrate and lipid.

Unit 2:

8 Hours

Blood: Composition and functions, Blood groups, Rh factor and their significance, blood clotting mechanism, anemia, heart,. Structure of kidney, types of nephron, mechanism of urine formation and its elimination and arginine, ornithin cycle.

Unit 3:

8 Hours

Respiratory system- Respiration, Structure of lung, mechanism of breathing, respiratory volume, respiratory pigment, exchange & transport of O₂ and CO₂, Factors affecting haemoglobin affinity for O₂, CO₂ transport, Effect of P^H and CO₂ concentration on Hb-O₂ affinity.

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Unit 4:

8 Hours

Histology of nervous tissue, classification of neuron, neuroglia, myelination, structural organization of CNS. Muscle: Structure of various types of muscles and mechanism of muscle contraction.

Unit 5:

8 Hours

Endocrine glands : Structure and functions of various endocrine glands, diseases caused by hormonal deficiency ; Mechanism of hormone action. Reproductive process: Male and female reproductive system (structure and function) of human, gametogenesis, menstrual cycle, birth control and its types.

Text/Reference Books:

1. W. A. Hoar "General & Comparative Animal Physiology 3rd Ed." Prentice Hall Inc., 1982
2. Comparative Animal Physiology", 4th Ed. Wiley – Liss Publ.
3. K. Schmidt – Niel "Animal Physiology: Adaptation & Environmental" 3rd Ed. Cambridge Univ. Press., 1983
4. R. W. Hill "Comparative Physiology of Animals – An Environmental Approach" Harper & Row Publ., 1978

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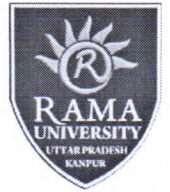
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BBS-314: Genetics

L T P

Credit: 4

3 1 0

OBJECTIVE:

To describe the processes of gene regulation and predict how a gene will be expressed under specific circumstances.

OUTCOME:

Genetics seeks to understand how genetic variation relates to human health and disease. When searching for an unknown gene that may be involved in a disease, researchers commonly use genetic linkage and genetic pedigree charts to find the location on the genome associated with the disease.

CONTENTS:

Unit 1:

8 Hours

Mendel's work, Laws of heredity (Law of segregation, Law of independent assortment), Test cross, back cross, Mono, di and Tri hybrid cross with simple problems. Alleles; codominant alleles, multiple alleles, lethal alleles.

Unit 2:

8 Hours

Epistasis, dominant and recessive gene interaction, genetic linkage. Sex chromosomes and sex determination; sex chromosomes, chromosomal Basis of sex determination, non chromosomal Basis of sex determination, sex linked inheritance.

Unit 3:

8 Hours

Coupling and repulsion hypothesis, Linkage in maize and Drosophila, Mechanism of crossing over and its importance.

Unit 4:

8 Hours

A General account of structural and numerical aberrations, Cytoplasmic Inheritance: Plastid inheritance in *Mirabilis*, petite characters in yeast and kappa particles in paramecium. Human Genetics Karyotype



in man, Inherited disorders - Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and cri-du-chat syndrome).

Unit 5:

8 Hours

Spontaneous and induced, Mutagens: Physical and chemical. Mutations in plants, animals, and microbes for economic benefit of man.

Text/Reference Books:

1. S.R. Maloy, J.E. Cronan, D. Friefelder, Microbial Genetics, 2nd Edition, Jones and Bartlett Publishers, 1994.
2. N. Trun and J. Trempy, Fundamental Bacterial Genetics, Blackwell publishing, 2004.
3. Strachan T and Read A P, Human molecular genetics, 3rd Edition Wiley Bios, 2006.
4. Mange E J and Mange A. P., Human genetics, 2nd Edition, Sinauer Associates publications, 1999.
5. Hartl L D and Jones B, Analysis of genes and genomes, 3rd Edition, Jones and Bartlett Publishers, 1994

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BBS-315: Plant Biotechnology

L T P

Credit: 4

3 1 0

OBJECTIVE:

To study classical and modern plant biotechnology processes, including breeding of healthy plants, plants with improved characteristics.

OUTCOME:

The aims of applied plant science research for agriculture are to enhance crop yields, improve food quality, and preserve the environment where human beings and other organisms live. Furthermore, food quality will become more important than crop productivity in a wealthy society.

CONTENTS:

Unit 1:

8 Hours

Introduction to in vitro methods: Terms and definitions, use of growth regulators, beginning of in vitro cultures in India, ovary and ovule culture in vitro pollination and fertilization, embryo culture, embryo rescue after wide hybridization and its applications, endosperm culture and production of triploids.

Unit 2:

8 Hours

Introduction to the process of embryogenesis and organogenesis and their practical applications: Clonal multiplication of elite species (micropropagation), maxillary bud, shoot-tip and meristem culture, haploid production and their applications, somaclonal variations and applications (treasure your applications), practical applications of tissue and organ culture (summarizing the practical application of all the above mentioned technique) single cell suspension, culture and their applications in selection of variants mutants with and without treatment (of haploid culture preferably).

Unit 3:

8 Hours

Introduction to Protoplast isolation: principle and application, testing of viability of isolated protoplasts, various steps in the regeneration of protoplasts. Somatic hybridization-an introduction, various methods



for fusing protoplasts, chemical and electrical, use of markers for selection of hybrid cells, practical applications of somatic hybridization (hybrid vs. cybrids).

Unit 4:

8 Hours

Use of plant cell, protoplast and tissue culture of genetic manipulation of plant: introduction to *A. tumefaciens*, tumor formation on plants using *A. tumefaciens* (monocots vs. dicots), rot formation using *A. rhizogenes*, practical application of genetic transformation.

Unit 5:

8 Hours

Transgenic plant for the production of human therapeutics, edible vaccines, herbicides, insect resistance, production of secondary metabolites, biotransformation, elicitors, immobilized cells.

Text/Reference Books:

1. Bhojwani SS. Plant Tissue Culture: Theory and Practice . Elsevier, 1983.
2. Christou P & Klee H. Handbook of Plant Biotechnology. John Wiley & Sons. 2004.
3. Dixon RA. Plant Cell Culture. IRL Press, 2003.
4. George EF, Hall MA & De Klerk GJ. Plant Propagation by Tissue Culture. Agritech Publ. 2008.
5. Pena L. Transgenic Plants: Methods and Protocols. Humana Press, 2004.

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BBS-361: Enzymology Lab

L T P

Credit: 1

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1. Isolation of Enzyme from different microorganism
2. Isolation of alpha amylase from plant source
3. Determination of Enzyme activity
4. Effect of pH on Enzyme kinetics
5. Effect of temperature on Enzyme kinetics
6. Identification of Enzyme by different assay
7. Purification of enzymes by different methods
8. Immobilization of Enzyme by sodium Alginate method

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BBS-362: Plant Biotechnology

L T P

Credit: 1

0 0 2

1. Preparation of plant tissue culture media.
2. Surface sterilization.
3. Organ culture.
4. Protoplast isolation and culture.
5. Anther culture: production of haploids.
6. Cytological examination of regenerated plants.
7. Micropropagation of banana, citrus Papaya, Sugarcane etc.
8. Cell suspension culture from different tissues.
9. Artificial seed preparation
10. Cytological examination of regenerated plants
11. Transfer of plants to soil.

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Second Year- 4th Semester
BBS-411: Molecular Biology

L T P
3 1 0

Credit: 4

OBJECTIVE:

Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development

OUTCOME:

Molecular biology is a large and ever-changing discipline. This course will emphasize the molecular mechanisms of DNA replication, repair, and protein synthesis. At the end of this course students should be able to demonstrate a clear understanding of the facts and basic concepts of molecular biology.

CONTENTS:

Unit 1:

8 Hours

DNA as the genetic material: Griffiths and Hershey-Chase experiment, Central Dogma of molecular biology, structure of A, B and Z-DNA, structure of RNA (t-RNA, m-RNA and r-RNA), DNA denaturation and renaturation.

Unit 2:

8 Hours

DNA Replication: (prokaryotic and eukaryotic), Modes, Components of cellular replisomes and their functions, types and activities associated with prokaryotic and eukaryotic DNA polymerases and their functions. Origin of replication in prokaryotes and eukaryotes. Replication of telomeric sequences.

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Unit 3:

8 Hours

Transcription: Introduction, promoter architecture in prokaryotes and eukaryotes. Subunit structure of prokaryotic RNA polymerase. Types of eukaryotic RNA polymerases. Stages of transcription, sequence of events in initiation of transcription in prokaryotes and eukaryotes. Elongation and termination of transcription. Introduction to other regulatory elements.

Unit 4:

8 Hours

Genetic code, wobble hypothesis, Translation: (Eukaryotic & prokaryotic), translation machinery, mechanisms of initiation, elongation and termination.

Unit 5:

8 Hours

Regulation of gene expression in prokaryotes. The operon concept. The lac operons, Mutations: Spontaneous and induced; chemical and physical mutagens. DNA repair.

Text/Reference Books:

1. Benjamin Lewin, Gene IX, 9th Edition, Jones and Barlett Publishers, 2007.
2. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner; Molecular Biology of the Gene, 6
3. The Edition, Benjamin Cummings Publishing Company Inc, 2007.
4. Alberts et al; Molecular Biology of the Cell, 4th edition, Garland, 2002.

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BBS-412: Animal Biotechnology

L T P
3 1 0

Credit: 4

OBJECTIVE:

This course deals with the applications and tools of molecular biology and biotechnology for the improved production and protection of animals, animal products.

OUTCOME:

For the improvement of animal production, biotechnological techniques like transgenic animal, and bio pharming have been explained. Other biotechnological techniques which have been used to improve the animal production including mapping of genome, cell cloning and, gene banking, genetic manipulation of microbes to improve feed utilization and health are also explained.

CONTENTS:

Unit 1: **8 Hours**

Animal Cell Culture: Equipment's and materials for animal cell culture technology. Various systems of tissue culture, their distinguishing features, advantages and limitations. Culture medium: natural media, synthetic media, sera. Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, role of carbon di oxide, serum and supplements.

Unit 2: **8 Hours**

Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication, Cell senescence; cell and tissue response to trophic factors. Primary Culture: Behavior of cells, properties, utility. Explant culture; suspension culture. Definition of cell lines, maintenance and management.

Unit 3: **8 Hours**

Measurement of viability and cytotoxicity. Cell cloning, cell synchronization and cell manipulation. Various methods of separation of cell types, advantages and limitations; flow cytometry. Scaling up of animal cell culture. Cell transformation.

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Unit 4:

8 Hours

Stem cell cultures, embryonic stem cells and their applications. Somatic cell genetics. Apoptosis: Measurement of cell death. Apoptosis (death domain, role of cytochrome C. Three dimensional cultures and tissue engineering.

Unit 5:

8 Hours

Commercial applications of cell culture: Tissue culture as a screening system; cytotoxicity and diagnostic tests. Mass production of biologically important compounds (e.g. Vaccines). Harvesting of products, purification, and assays.

Text/Reference Books:

1. Watson, J.D., Gilman, M., Witowski J. and Zoller, M. Recombinant DNA, 2nd ed., Scientific American Books, 1983
2. Glick, B.R. and Pasternack, J.J. Molecular Biotechnology, 3rd ed., ASM Press, 2003
3. Davis J.M. Basic Cell Culture: A Practical Approach, IRL Press, 1998
4. Freshney R.I. Animal Cell Culture a practical approach, 1987

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BBS-413: Biostatistics

L T P

Credit: 4

3 1 0

OBJECTIVE:

Statistics is the science in which we make inferences about some specific random process based upon a sample of data which is sometimes quite limited.

OUTCOME:

This course is designed to teach students the basic principles of biostatistics. It can be a first course in biostatistics for those students who will use the knowledge they acquire to enable them to continue learning more advanced techniques in future statistical and biostatistical course work.

CONTENTS:

Unit 1:

8 Hours

Introduction to Biostatistics: definition, statistical method, Biological measurement, kinds of Biological data, function of statistics and limitation of statistics. Application of Biostatistics, Role of Biostatistics in modern research, parametric and nonparametric methods (Tests).

Unit 2:

8 Hours

Collection of data, Presentation of Data, classification and tabulation, types of representation (graphic-bar diagram, pie diagram and curves and Basic concept of calculus). Sampling and sampling design.

Unit 3:

8 Hours

Measure of central tendency, mean, Median, Mode, Geometric Mean, Measure of dispersion, Variability and changes, Deviations-quartile deviation, mean deviation, standard deviation, standard Error, coefficient of variations.

Unit 4:

8 Hours

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Test of Hypothesis, Test of significance, chi-square test, t-test, and ANOVA (Analysis of variance) One way and two way classification.

Unit 5:

8 Hours

Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability,. Probability of an event, probability of 'not', 'and' & 'or' events. Probability Distributions: Binomial Distribution, Poisson distribution and Normal Distribution.

Text/Reference Books

1. Wayne W. Daniel, Biostatistics : A foundation for Analysis in the Health Sciences, 8th Edition, Wiley, 2004.
2. Prem S. Mann, Introductory Statistics, 6th Edition, Wiley, 2006.
3. John A. Rice, Mathematical Statistics and Data Analysis, 3rd Edition, John A. Rice, Duxbury Press, 2006.



BBS-414: Bioinformatics

L T P

Credit: 4

3 1 0

OBJECTIVE:

The basic objective is to give students an introduction to the basic practical techniques of bioinformatics.

OUTCOME:

Bioinformatics is the science of storing, extracting, organizing, analyzing, interpreting and using information. The approaches to the discipline of bioinformatics incorporate expertise from the biological sciences, computer science and mathematics.

CONTENTS:

Unit 1:

8 Hours

Introduction of Bioinformatics, Biological Data Bases. Primary and secondary data Bases. Specialized sequence data Bases of EST, TFB Sites, SNP's, gene expression. Pfam, PROSITE, BLOCK (Secondary data Bases). Data retrieval with ENTREZ, SRS, DBGET.

Unit 2:

8 Hours

Principles of DNA sequencing (chemical chain termination, Dideoxy chain termination method, Automatic sequencer). RNA sequencing. Protein sequencing (Edmand degradation method).

Unit 3:

8 Hours

Sequence alignment (pairwise and multiple, global and local). Sequence alignment algorithm (FAST, BLAST, Needleman and Wunsch, Smith Waterman). Data Bases similarity searches (BLAST, FASTA and PSI BLAST). Amino acid substitution matrices (PAM BLOSUM).

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Unit4:

8 Hours

Protein structure prediction (Chou Fasman method) : Secondary and tertiary structures. Homology Modelling, ORF prediction, Gene prediction, Micro array data analysis. Profiles and motifs.

Unit 5:

8 Hours

Structure visualization methods (RASMOL, CHIME etc.). Protein Structure alignment and analysis. Application of Bioinformatics in drug discovery and drug designing.

Text/Reference Books

1. John A. Rice, Mathematical Statistics and Data Analysis, 3rd Edition, John A. Rice, Duxbury Press, 2006.
2. Campbell and Heyer, Discovering Genomics, Proteomics, & Bioinformatics, 2nd Edition, Benjamin Cummings, 2002.
3. Cynthia Gibas and Per Jambeck, Developing Bioinformatics Computer Skill, 1st Edition, O'Reilly Publication, 2001.

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BBS-415: Ethics, Patenting and Bio-Entrepreneurship

L T P
3 1 0

Credit: 4

OBJECTIVE:

To study advanced biology/biotechnology with business tools and methods.

OUTCOME:

- 1- One can learn what is required to translate scientific research and patents into innovative products and viable business opportunities.
- 2- The teaching draws on industry experts, high quality academic faculty, real life cases, insight into bio ventures, and includes a three-month internship in one of Denmark's leading life-science companies

CONTENTS:

Unit 1:

8 Hours

Risk assessment, risk management, risk monitoring, risk communication, Biological containment, Physical containment, Good laboratory practices, Physical strategies for confinement, Biological strategies for confinement.

Unit 2:

8 Hours

Recombinant DNA advisory committee, institutional biosafety committee, Review committee on genetic manipulation, Genetic engineering approval committee, State biotechnology formation committee, District level committee Recombinant DNA safety guidelines, revised guidelines for research in transgenic plants, Cross border movement of transgenic germplasm for research purposes. Biosafety concerns: risk to human health, risk of toxicity, risk of allergies, antibiotic resistance.

Unit 3:

8 Hours

Protection of intellectual property, World organization, Forms of protection: copy right, trade mark. Patent: patent application, International patenting and patent cooperation treaty, Uses of technical

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information in patent document, Revocation of patent. Patenting of biological material (Microorganism, plant patent, and animal patent)

Unit 4:

8 Hours

Patenting procedure in India, Geographical indication, Trade secret, Design, Layout design of integrated circuits.

Unit 5:

8 Hours

Plant breeders rights: UPOV, functions of UPOV: Breeder exemption, Farmers privilege Plant variety protection in India: Farmers rights, Advantages & disadvantages of PBR.

Important Links

<http://www.w3.org/IPR/>

<http://www.wipo.int/portal/index.html.en>

http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html www.patentoffice.nic.in

www.iprlawindia.org/ - 31k - Cached - Similar page

<http://www.cbd.int/biosafety/background.shtml>

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BBS-461: Molecular Biology Lab.

L T P

0 0 2

Credit: 1

1. Estimation of DNA content in the given sample by diphenylamine method.
(Nitrogen cylinders, -200C fridge, grinders, cooling centrifuges, etc.)
2. Estimation of RNA content by the Orcinol method.
3. Determination of Tm of DNA and RNA.
4. Isolation of Plasmid DNA
5. Isolation of bacterial/fungal genomic DNA.
6. Isolation of plant DNA.
7. Purification of DNA through columns.
(Sorval, Cyclomixer, Electrophoresis units both vertical & horizontal, transilluminator, U.V. Torch, Gel documentation system, Thermal cyler etc.)

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BBS-463: Bioinformatics Lab

L T P

Credit: 1

0 0 2

1. Explore NCBI.
2. Access and use of different online protein and gene alignment softwares
3. Gene finding related search for a given nucleotide sequence in order to predict the gene
4. ORF prediction for different proteins out of some given nucleotide sequences.
5. Exon identification using available softwares for a given nucleotide sequences
6. Secondary structure prediction for amino acid sequences of a given protein.

Convener

Signature: 

Name : Dr. Ajay Kumar

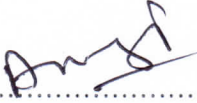
Date :

Internal Members

Signature: 1. 

Name: Dr. Vivek Srivastava

Date:

Signature: 2. 

Name: Er. Anjani Kumar Srivastava

Signature: 3. 

Name: Mrs. Rati Bajpai

Date:

Signature: 4. 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1. 

Name: Prof. Nand Lal

Date:

Signature: 2. 

Name: Er. Vishal Kumar Srivastava

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Third Year -5th Semester
BBS-511: Genetic Engineering

L T P
3 1 0

Credit: 4

OBJECTIVE:

Genetic engineer is gene manipulation/gene cloning/recombinant DNA technology. The primary objective of this practice is to have as many identical copies of a gene.

OUTCOMES:

Genetic engineering is an important tool for natural scientists, with the creation of transgenic organisms one of the most important tools for analysis of gene function. ... Loss of function experiments, such as in a gene knockout experiment, in which an organism is engineered to lack the activity of one or more genes.

CONTENTS:

Unit 1:

8 Hours

Gene cloning-concept and basic steps; application of bacteria and viruses in genetic engineering; Molecular biology of *E. coli* and bacteriophages in the context of their use in genetic engineering, Cloning vectors: Plasmid vector, PBR322, Bacteriophage- λ , M-13 and other phage vectors; Cosmids, Phagemids; YAC and BAC, Expression vector.

Unit 2:

8 Hours

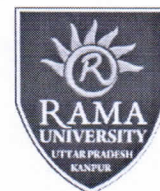
Restriction modification, enzymes used in recombinant DNA technology Endonucleases, ligases and other enzymes useful in gene cloning.

Unit 3:

8 Hours

CR technology, types of PCR for gene/DNA detection, cDNA Gene library: Construction cDNA library and genomic library, screening of gene libraries – screening by DNA hybridization, Selectable markers.

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Unit 4:

8 Hours

Preparation and application of molecular probes: DNA probes, RNA probes, Radioactive labeling, Non radioactive labeling, use of molecular probes, DNA fingerprinting. Southern blotting, Northern blotting, Western blotting, In-situ hybridization. Colony and plaque hybridization. RFLP, AFLP, RAPD, SNP, Dot Blot, Microarray Technology.

Unit 5:

8 Hours

Cloning of sheep (Dolly) & other mammals; applications in conservation; therapeutic vs. reproductive cloning; ethical issues and the prospects for human cloning.

Text/Reference Books:

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B. University Press, 2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001.
3. Brown TA, Genomes, 3rd ed. Garland Science 2006
4. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc

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BBS-512: Environmental Science

L T P
3 1 0

Credit: 4

OBJECTIVE:

The objective of the Environmental Studies is to study the concept of sustainability in an integrated way, including environmental, economic, and social aspects.

OUTCOMES:

Environmental science also branches out into environmental studies and environmental engineering. It provides integrated and interdisciplinary approach to the study of environmental problems. Environmental studies are the study of social sciences to understand human interactions with the environment

CONTENTS:

Unit 1:

8 Hours

Environmental Sciences: Introduction, definition, Scope, Importance, Need for Public Awareness
Natural Resources: Renewable and non Renewable resources, Biogeochemical Cycles Ecological Succession, Ecological pyramids.

Unit 2:

8 Hours

Concept of an Ecosystem: Structure and function of an ecosystem ,Producers, consumers and decomposers, Energy flow in the ecosystem ,Ecological succession, Food chains, food webs and ecological , pyramids , Introduction, types, characteristic features, structure and function of the following ecosystem. Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean).

Unit 3:

8 Hours

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Asmita
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Environmental pollution and pollutants, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Unit 4:

8 Hours

Introduction – Definition: genetic, species and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive uses, social, ethical aesthetic and option values ,Biodiversity at global, national and local levels ,India as a mega-diversity nation ,Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts ,Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Biodiversity and its conservation: introduction value of biodiversity, biodiversity at global, national and local level, hotspots of biodiversity, and its conservation.

Unit 5:

8 Hours

Global warming, acid rains, depletion of ozone layer population growth the population explosion, family welfare |Program, human rights, Biofertilizers, Biopesticides vermicomposting.

Text/Reference Books

1. Environmental studies By Dr. S.K. Dhameja
2. Environmental & Ecology P.K. Agrawal
3. Environmental & Ecology Deswal & Deswal
4. BBSic concepts and applications in environment Indusekher Thakur

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BBS-513: Immunology

L T P

Credit: 4

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OBJECTIVE:

The students will be able to identify the cellular and molecular basis of immune responsiveness the roles of the immune system in both maintaining health and contributing to disease.

OUTCOMES:

Immunology is the study of the immune system in both healthy and diseased states. It includes the study of how the body fights infections from bacteria and viruses, and the development of medical interventions to treat and prevent diseases.

CONTENTS:

Unit 1:

8 Hours

History & phylogeny of Immune system. Types of immunity. Cells & organs of the immune system. Structure and function of immunoglobins. Nature of antigens, antigenicity and immunogenicity. Lymphocyte traffic.

Unit 2:

8 Hours

BCR & TCR and generation of immunological diversity. Activation of B and T cell lymphocytes. Antigen antibody interactions, cross reactivity, precipitation reactions – their principles and applications serological techniques – ELISA, RIA and western blotting.

Unit 3:

8 Hours

Immunological tolerance. Induction of tolerance; T- cell anergy; immunologically privileged sites. MHC structure and function; MHC –polymorphism; disease susceptibility, MHC restriction. Antigen processing and presentation: generation of MHC class-I and class-II peptides and their association with antigenic peptides. Generation of immunological response and its genetic control. Transplantation

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immunology: Immunological Basis of graft rejection; immunosuppressive therapy. Complement system: Consequences of complement activation and regulation.

Unit 4:

8 Hours

Hypersensitivity reactions: Types of hypersensitive reactions: immunoprophylactic interventions. Autoimmunity—systemic and localized autoimmunity and probable mechanisms to develop autoimmunity. Immunodeficiency; primary, secondary immunodeficiency; SCID and AIDS. Tumor immunology –tumor antigens, immunological factors influencing the incidence of cancer, effector mechanisms in cancer immunity.

Unit 5:

8 Hours

Vaccines: Historical perspective; bacterial, viral vaccines and vaccines against cancer and birth control vaccines. Antibody engineering: monoclonal and polyclonal sera their role in clinical diagnosis; production of monoclonal antibodies; immunotoxins and their therapeutic uses; humanized and chimeric antibody.

Text/Reference Books:

1. Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. Osborne Immunology, 6th Edition, Freeman, 2002.
2. Brostoff J, Seaddin JK, Male D, Roitt IM., Clinical Immunology, 6th Edition, Gower Medical Publishing, 2002.
3. Janeway et al., Immunobiology, 4th Edition, Current Biology publications. 1999.
4. Paul, Fundamental of Immunology, 4th edition, Lippencott Raven, 1999.

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BBS-561: Immunology Lab

L T P

Credit: 1

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1. To determine the blood group of given blood
2. To determine the Rh factor of given blood
3. To perform single radial immunodiffusion
4. To perform double immunodiffusion
5. To perform rocket immune electrophoresis
6. To perform ELISA
7. To prepare the blood smear and stain with Leishman stain
8. To identify the blood cells/ immune cell with the help of Leishman stain
9. To perform differential count (DLC) of given sample.

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BBS-562: Mini Project Work and Presentation

Students have to perform a mini project work related to their respective stream in B.Sc. The project work may be software or hardware based. It may be extendable to major project.

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Third Year- 6th Semester
BBS-611: Industrial Biotechnology

L T P
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Credit: 4

OBJECTIVE:

The course aims to provide fundamental insights to exploit enzymes and microbes for the manufacturing of products which have a huge industrial significance. The course majorly focuses on the applications and allows students to gain practical knowledge rather than mere theory.

OUTCOMES:

Industrial biotechnology is the application of biotechnology for industrial purposes, including manufacturing, alternative energy and biomaterials. ... (Industrial Biotechnology) is four years duration course. It is an important one which provides many job opportunities to the candidates in the field of industry.

CONTENTS:

Unit 1:

8 Hours

Introduction to Industrial Biotechnology/Microbiology: Brief History and Developments in Industrial Biotechnology/Microbiology, techniques of microbial culture, growth media, sources of nutrition, maintenance of microbial culture and strain preservation.

Unit 2:

8 Hours

Improvement of Industrial Strains: mutation, genetic engineering techniques, preservation of cultures- storage on agar slants, soil culture, lyophilization, storage in liquid nitrogen.

Unit 3:

8 Hours

Fermentation: Brief introduction, Types of fermenter-aerated and agitated fermenter, Basic function of Baffle, Impeller and Sparger.

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Unit 4:

8 Hours

Downstream processing: Solid-liquid separation, flotation, flocculation, filtration, centrifugation, cell disruption, concentration, evaporation, liquid-liquid extraction, membrane filtration, precipitation, adsorption. Product purification by chromatography.

Unit 5:

8 Hours

Industrial process of beverages - enzymes - amino acid - organic acids - organic solvents - antibiotics.

Text/Reference Books:

1. Alexander n. Glazer Hiroshi Nikaido W.H. Microbial Biotechnology, Freeman and Company, 1995
2. Kun LY. Microbial Biotechnology. World Scientific, 2006.
3. Crueger and A Crueger, (English Ed., TDW Brock); Biotechnology: A textbook of Industrial Microbiology, Sinaeur Associates, 1990.
4. G Reed, Prescott and Dunn's, Industrial Microbiology, 4th Edition, CBS Publishers, 1987.
5. M.T. Madigan and J.M. Martinko, Biology of Microorganisms, 11th Edition, Pearson Prentice Hall, USA, 2006.

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BBS-612: Nanobiotechnology

L T P
3 1 0

Credit: 4

OBJECTIVE:

Nanobiotechnology is a discipline in which tools from nanotechnology are developed and applied to study biological phenomena. For example, nanoparticles can serve as probes, sensors or vehicles for biomolecules delivery in cellular systems.

OUTCOMES:

Nanotechnology can enable sensors to detect very small amounts of chemical vapors. Various types of detecting elements, such as carbon nano-tubes, zinc oxide nano-wires or palladium nanoparticles can be used in nanotechnology-based sensors.

CONTENTS:

Unit 1: **8 Hours**

Introduction to nanotechnology - history and recent developments - sources of nanoparticles - microbial production of nanoparticles - advantages of microbial nanoparticles - applications.

Unit 2: **8 Hours**

Basic biology principles and practice of micro fabrication techniques, Atomic force microscopy, macro molecular assemblies.

Unit3: **8 Hours**

Developing drug delivery tools through nano biotechnology, nano particle based immobilization assays, quantum dots technology and its application.

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Unit 4:

8 Hours

Synthesis and characterization of different classes of biomedical polymers- their uses in pharmaceutical, cardiovascular ophthalmologic orthopedic areas.

Unit 5:

8 Hours

Viruses as nano-particles , nano chemicals and application., tumor targeting and other diagnostic applications.

Text/Reference Books

1. Nanobiotechnology- concepts, applications and perspectives, niemeyer, christof m. Mirkin, chad a., wiley publishers.
2. Nanobiotechnology of biomimetic membranes, martin, donald (edt), springer verlag publishers.

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BBS-661 Major Project Work and Presentation

A group of students have to make a latest technology based project in their respective stream. It may be hardware or software based.

BBS-662 Seminar

Students have to deliver presentations on research & recent technologies with respect to his/her course.

Convener

Signature: 

Name : Dr. Ajay Kumar

Date :

Internal Members

Signature: 1..... 

Name: Dr. Vivek Srivastava

Date:

Signature: 2..... 

Name: Er. Anjani Kumar Srivastava

Signature: 3..... 

Name: Mrs. Rati Bajpai

Date:

Signature: 4..... 

Name: Dr. Deeksha Ranjan

External Members

Signature: 1..... 

Name: Prof. Nand Lal

Date:

Signature: 2..... 

Name: Er. Vishal Kumar Srivastava