



GOVERNOR'S SECRETARIAT, BIHAR
RAJ BHAVAN, PATNA-800022

Letter No.-PU(Regulation)-08/2005(Part)- /GS(I), Dated-

From,

R.V.S. Parmar,
Law Officer-cum-Incharge OSD(J)

To,

The Registrar,
Patna University,
Patna.

Sub:- Regarding approval of the Ordinance and Regulations under Choice Based Credit System (i) B.A. (Hons.) in Mass Communication (ii) Bachelor of Business Administration (Hons.) (iii) B.A. (Hons.) in Computer Applications (iv) B.Sc. (Hons.) in Biotechnology (v) B.Sc. (Hons.) in Computer Applications (vi) B.A. (Hons.) in Functional English, a self-financing programme to be effective from the session 2019-2022 onwards.

Sir,

I am directed to invite a reference to the University's Letter No.- Acad/9209, Letter No.- Acad/9293, Letter No.- Acad/9183, Letter No.- Acad/9203, Letter No.- Acad/9185, Letter No.- Acad/9199, all dated 16-10-2019 on the subject mentioned above and to inform that the Hon'ble Chancellor after due consideration of the proposal of the University and advice of the Advisory Committee and in exercise of the powers vested in him u/s 38(2) and 39(2)(ii) of Patna University Act, 1976 as amended up to date, has been pleased to approve the draft Ordinance and Regulations of the following courses under self-financing programme to be effective from the session 2019-2022 and onwards:-

- (i) B.A. (Hons.) in Mass Communication
- (ii) Bachelor of Business Administration (Hons.)
- (iii) B.A. (Hons.) in Computer Applications
- (iv) B.Sc. (Hons.) in Biotechnology
- (v) B.Sc. (Hons.) in Computer Applications
- (vi) B.A. (Hons.) in Functional English

However, Ordinance and Regulations if any, approved earlier in respect of the above courses /programmes shall deem to be **repealed** to the extent aforesaid.

Further necessary action may kindly be taken accordingly.

Yours faithfully,
Sd/-

Encl:-As above.

(R.V.S. Parmar)
Law Officer-cum-Incharge OSD(J)

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Annex I

PATNA UNIVERSITY, PATNA

B.A. (Hons) in Functional English

(Under Self financing Scheme)

UNDER Choice Based Credit System

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ORDINANCE OF B.A. (HONS.) IN FUNCTIONAL ENGLISH
Under Self Financing Scheme

“Ordinance for Admission to the B.A. Hons. in Functional English), B.N. College, Patna University, Patna.”

- 1. Admission to B.A. Hons. in Functional English shall be open for both boys and girls.
- 2. Candidates who have passed the Intermediate Examination conducted by a recognised board or a University established or incorporated by law, or have passed + 2 level examination under 10+2 school system conducted by a Central or State Board or equivalent examination thereof shall be eligible to apply for admission.

2.1 Candidates who have passed the Intermediate or its equivalent examination with English as one of the subjects shall be eligible to apply for admission.

2.2 Admission to this course shall be made on the basis of the marks obtained at an Aptitude Test followed by a viva-voce exam, to be conducted by the College / University.

2.3 The number of seats for this course shall be 30. Five more candidates may be admitted in view of the possible drop-outs. In addition, five candidates may be admitted from NRI quota.

2.4 The reservation of seats for this course shall be as per rules of the State Government / P.U. for the candidates of S.C., S.T., BC-I and BC-II and other categories.

3. Selection of Students to the Elective Course:

3.1 The Departmental Council / Admission Committee shall follow a selection procedure on a first come first serve basis, fixing the maximum number of students, giving counselling to the students etc to avoid overcoming to a particular course(s) at the expense of some other courses.

3.2 The colleges shall provide all information relating to the ECs in each programme to all the students so as to enable them to choose their ECs.

3.3 Universities/Institutes may evolve a system/policy about Extra Curricular Activities/general interest and hobby courses/sports/NCC/NSS/Add-on Certificate courses on their own.

3.4 The new scheme of UG courses should be given due consideration while framing the admission eligibility requirements for PG/Technical courses in Indian Universities/Institutions to ensure that students following inter and multidisciplinary format under CBCS are not at a disadvantage. If a student obtains 24 credits in a particular discipline it may be considered as the minimum eligibility for admission in the concerned discipline, for entry to PG/Technical courses in Indian Universities/Institutions.

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Table. 4: FEE STRUCTURE PER year i.e. valid for two semesters for Under Graduate Degree

[B.A. (Hons.) in Functional English] Under Self-financing Scheme
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Sl. No.	Head/Item	For Indian Resident Fee in Indian Rupees.	Non-Residents Indian (NRI) and Foreign Students in US dollar(\$)
I	Admission Fee (Per semester)	200	Double Fee to be realized in U.S. dollars
II	Registration fee (one time) if applicable	As per Univ. letter	
III	Caution Money (one time)	N.A.	
IV	Tuition Fee (per semester)	10,000	
V	Eklavya & Tarang (one time in each Academic Session)	10	
VI	Total	10,210	
VII	Miscellaneous (Per semester)		
	Central library	100	
	Electricity + Water fee	1000	
	Identity card fee	50	
	NSS fee	50	
	Parking	1000	
	Internal Examination fee	900	
	Dept. Library Maintenance Fund	1100	
	Building Maintenance Fund	100	
	Medical fee	50	
	Athletic Fund (for College)	50	
	Athletic Fund (for University)	100	
	Common room Fund	50	
	Extra-curricular Fee (Cultural)	20	
	Environmental Protection Fee	10	
	Student's Welfare Fee	10	
	Poor student's fund	20	
	Student's Union Fund	50	
	Society Subscription	80	
	Magazine Fund	50	
	Hand Book / Directory	4790	
VIII	Total	15000	
IX	Grand total	14900	
X	Less Registration fee	14900	
XI	Total amount 1 st semester & 2 nd Semester	N.A.	
XII	Total amount in subsequent semesters excluding caution money & Registration Charges	500	
XIII	Project Supervision fee in semester VI	Would be decided by the T.V. Training Centres	
XIV	Field work as per our syllabus in Sem. VI The time would be decided by T.V. Training Centres		
XV	1. The order of the GOB issued from time to time in regards to fee structure will be followed strictly.		

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5. Each candidate shall have to pay Rs. 1000/- as examination fee for each year of examination in addition to the other fees. In addition a candidate shall have to pay Rs. 1000/- as project supervision fee in the third year.
6. The fee structure may be reviewed after every three years by the Vice-chancellor in consultation with the officials concerned.

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REGULATIONS FOR B.A. (HONS.) IN FUNCTIONAL ENGLISH (Self financing)
PATNA UNIVERSITY, PATNA.

Duration of the Course

1. The B.A. Hons. in Functional English Course shall be covered in three years i.e. Semester I, Sem. II, Sem. III, Sem. IV, Sem. V & Sem. VI.

Eligibility for Admission:

2. To be eligible for admission a candidate must have
 - (a) Passed Intermediate Examination conducted by a Board or University established or incorporated by law or the Central or State Board 10+2 School systems or equivalent thereof with English as one of the subjects. The candidates must have secured at least 45% marks.
 - (b) Must have qualified in the Aptitude Test followed by viva-voce examination to be conducted by the college.

Aptitude Test and Viva-Voce Examination

- 3.1. Admission to B.A. Hons. in Functional English course shall be made on the basis of the marks obtained at the Aptitude Test and viva-voce exam taken together to be conducted by the college. The Written examination shall be of 75 marks and Viva-voce Test shall be of 25 marks. On the basis of the marks obtained in written & viva-voce a merit list will be prepared for admission to the course.
- 3.2. Reservation of seats for admission shall be provided to the candidates belonging to S.C., S.T. and BC-I and BC-II as per rules of State Government / Patna University.

Subjects for Examination and Structure of the Course

- 4.1 A Candidate for B.A. Hons. in Functional English course shall be required to be examined in altogether Core Course fourteen papers, AECC two papers, SEC two papers, GE four papers, DSE four papers.
- 4.2 Vocational Honours Subject
Functional English

5. The Teaching Scheme: CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can

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be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Outline of Choice Based Credit System:

It consists of a number of courses. Each course is equivalent to a paper.

- 1.1 Core Course (CC): A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core Course.
 - 1.2 Elective Course (EC): Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/ subject/ domain or nurtures the candidate's proficiency/skill is called an Elective.
 - 1.2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also have discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/ subject of study.)
 - 1.2.2 Dissertation/Project: An elective course designed to acquire special/ advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.
 - 1.2.3 Generic Elective Course (GE): An elective course chosen generally from an unrelated discipline/ Subject, with an intention to seek exposure is called Generic Elective.
- P.S.: A core course offered in a discipline/ subject may be treated as an elective by other discipline/ subject and vice versa and such electives may also be referred to as Generic Elective.
- 1.2.4 Those who has opted any particular paper either in compulsory or in general elective, then such paper cannot be opted as discipline specific elective paper or vice versa.

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1.3 Ability Enhancement Courses (AEC): The Ability Enhancement (AE) courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).

1.3.1 "AECC" courses are the courses based upon the content that leads to knowledge enhancement: viz. Environmental Science and ii. English Communication/ MIL Communication.

1.3.2 Skill Enhancement Courses (SEC): SEC Courses are value based and/ or skill based and are aimed at providing hands-on-training, competencies, skill, etc. These courses may be chosen from a pool of courses designed to provide value based and/ or skill based knowledge.

1.4 Project Work/ Dissertation is considered a special course involving application of knowledge in solving/ analyzing/ exploring a real life situation/ difficult problem. A Project/ Dissertation work would be of 6 credits. A Project/ Dissertation work may be given in lieu of a Discipline Specific (DSE) paper in 6th Semester.

2. Implementation:

2.1 The CBCS shall be implemented in State University where above mentioned Core subject are taught, subject to the condition that all the stakeholders agree to common minimum syllabi of the core papers and at least follow common minimum curriculum as fixed by the UGC. The allowed deviation from the syllabi being 20% at the maximum with the approval of the University.

2.2 The Universities/ Autonomous Colleges under the State Universities may be allowed to finally design their own syllabi for the core and elective papers subject to point no. 1. UGC may prepare a list of elective papers but the Universities/Institutes may further add to the list of elective papers they want to offer as per the facilities available.

2.3 Number of Core papers for all Universities has to be the same for UG Honours course.

2.4 Credit score earned by a student for any elective paper has to be included in the student's overall score tally irrespective of whether the paper is offered by the parent University (degree awarding university/ institute) or not.

2.5 For the introduction of AE Courses, they may be divided into two categories:
(a) AE Compulsory Courses: The Universities participating in CBCS system may have common curriculum for these papers. There may be one paper each in the 1st two semesters viz. (i) English/ MIL Communication, (ii) Environmental Science.

(b) Skill Enhancement Courses: The Universities may decide the papers they may want to offer form a common pool of papers as prepared by the University/ Institution. The University may offer one paper in 3rd and 4th semester for their course.

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2.6 The University/Institute may plan the number of seats per elective paper as per the facility and infrastructure available.

2.7 An undergraduate degree with Honours in a discipline may be awarded if a student completes 14 core papers in that discipline, 2 Ability Enhancement Compulsory Courses (AECC), minimum 2 Skill Enhancement Course (SEC) and 4 papers each from a list of Discipline Specific Elective and Generic Elective papers respectively.

2.8 Core Subject: There shall be 14 core papers with 84 credits. Examination shall be conducted in all subjects at the end of every semester as given below:

2.8.1 Generic Elective Subject: There shall be 4 papers, 1 each in I, II, III & IV semesters. For all the four semesters the total no. of credits for Generic Elective courses shall be 24 only.

2.8.2 Discipline Specific Courses: 04 elective courses with $(4 \times 6) = 24$ credits are to be offered two in the 5th semester and 2 in the 6th semester. Discipline Specific Courses subjects are to selected from the list of electives prescribed by the board of studies concerned, as given in the table can choose any one of the papers, as given in the table, as elective for a particular semester whether 5th semester or 6th semester. Elective paper for a particular semester once chosen by a particular college should not be changed without getting prior permission and approval of the University.

2.8.3 Skill based subjects: BFE course shall offer 02 courses of skill based subjects. One each in III and IV semester with 04 credits each $(2 \times 4) = 08$ credits.

2.8.4 Ability Enhancement Compulsory Courses (AECC)
There are 02 Ability Enhancement Compulsory Courses offered:
a) English/MIL/Comm./Env. Sc. (Semester I)
b) English/MIL/Comm./Env. Sc. (Semester II)

Table: 01
Courses

		*Credits	
I.	Core Course (14 Papers)	$14 \times 06 = 84$	$14 \times 06 = 84$
II.	Elective Course (8 Papers)		
	A.1. Discipline Specific Elective (4 Papers)	$04 \times 06 = 24$	$04 \times 06 = 24$
	B.1. Generic Elective Interdisciplinary (4 Papers)	$04 \times 06 = 24$	$04 \times 06 = 24$
	Optional Dissertation or Project work in place of one Discipline Specific Elective paper (6 credits) in 6 th Semester.		
III.	<u>Ability Enhancement Courses</u>		
	1. Ability Enhancement Compulsory Courses (AECC) (2 Papers of 2 credit each)	$02 \times 04 = 08$	$02 \times 04 = 08$

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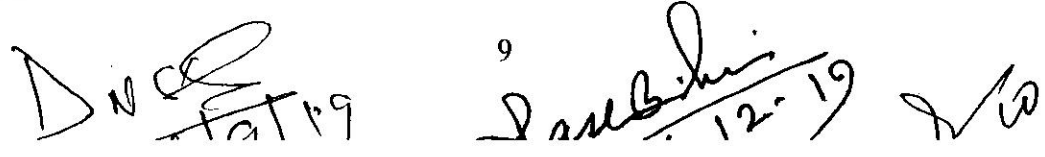
Environmental Science		
English/MIL Communication		
2. Skill Enhancement Courses (SEC) (Minimum 2) (2 Papers of 2 credits each)	02 × 04 = 08	02 × 04 = 08
Total Credit	148	148

Table : 02 Proposed Scheme for Choice Based Credit System in BFE Honours

Details of Courses

Scheme for Choice Based Credit System (CBCS)

Sem.	Core Course(14) of 6 credits each	Ability Enhancement Compulsory Course(AECC)(2) of 8/4 Credits each	Skill Enhancement Course(SEC)(2) of 4 Credits each	Discipline Specific Elective(DSE)(4) of 6 Credits each	Elective: Generic(GE) (4) of 6 Credits each
1	Core-1	AECC1 (Rashtra Bhasha Hindi)			GE1
	Core-2				
2	Core-3	AECC 2 (ENVS)			GE2
	Core-4				
3	Core-5		SEC 1		GE3
	Core-6				
	Core-7				
4	Core-8				GE4
	Core-9		SEC 2		
	Core-10				
5	Core-11			DSE-1	
	Core-12			DSE-2	
6	Core-13			DSE-3	



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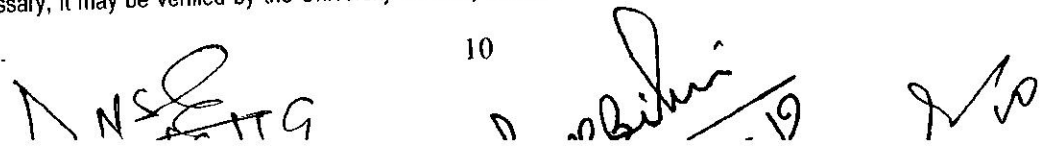
	Core-14			DSE-4	
No. of Credits	84	8	8	24	24
Total	148 Credits				

3. Attendance Requirements (subject to general regulations of Patna University)

- 3.1 It is expected that students will attend all the classes, i.e., 100% attendance.
- 3.2 A student must attend every lecture, tutorial and practical class given in a course, whether Core (C), Generic Elective (GE), Discipline Specific Elective (DSE), Ability Enhancement Compulsory Course (AECC) or Skill Enhancement Course (SEC).
- 3.3 A student's attendance in a course will include his/her attendance in lecture, class tests, tutorials, seminars and practical classes which together will be considered for calculation of his/her attendance percentage.
- 3.4 In no case students having less than 75% attendance shall be permitted to appear in semester end examination to be conducted by the Institution/University.
- 3.5 60% attendance is required for each course, for those with medical reasons (not less than 10 days). Application for leave along with a medical certificate issued by a registered medical practitioner signed by a parent must be submitted within one week of rejoining the college. If failed to submit the application within the due period, the absence will not be considered and no condonation of attendance shall be granted in any case.
- 3.6 Application for absence on medical ground needs to be substantiated with the medical certificate and the prescription for approval by the Principal/Director/Coordinator within one week of rejoining the college.
- 3.7 When absence of the student is caused by unforeseen events, application for leave duly signed by the student and the parent must be submitted to the Principal/Director/Coordinator.
- 3.8 In order to obtain exemption from games, sports, activities etc., on account of illness or any kind of physical disability, it will be necessary for students, to obtain a medical certificates to this effects.
- 3.9 In courses in which a student has 60% or more attendance, he/she will be allowed to attend make-up classes in the next academic year with regular students. He/she will need to obtain a certificate from the Principal/Director/Coordinator of the concerned department that he/she has completed the make-up classes. Then he/she will allowed to take the end semester examination in that particular course(s).
- 3.10 **Condoning absence:** The absence of a student may be condoned on the following grounds only:
 - a) Participation in NCC/NSS/AICUF camps (of minimum 10 days of duration)
 - b) Participation in state or national level sports/cultural meet/ This absence may be condoned, provided that prior permission in writing from the Principal/Director/Coordinator concerned has been taken and a certificate to this effect signed by the competent authority in the organization where he/she attended the event is furnished within a week of his/her rejoining the College. However, even after this consideration attendance of a student in a course has to be a minimum of 75% to enable his/her to write the end-semester examination.

4. **Extension Activities:** Proper relevant records shall be maintained by the respective Colleges/Departments and if necessary, it may be verified by the University authority at any time. The extension activities shall be conducted outside

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the regular working hours of the college. The mark sheet shall carry the gradation relevant to the marks awarded to the candidates. This grading shall be incorporated in the marks sheet to be issued at the end of the semester for which students shall pay fee for one theory paper.

1. Promotion to Higher Semester

Promotion of a student from one semester to the next higher semester is subject to certain conditions given below:

- 5.1 In every case, a student must have a minimum of 75% aggregate attendance in the current semester for promotion to the next higher semester.
- 5.2 Promotion from semester 1 to 2: the student should have at least 75% of attendance in aggregate in semester 1. Number of credits earned is not a requirement for this promotion.
- 5.3 Promotion from semester 2 to 3: A student should have at least 75% of attendance in the aggregate in Semester 2 and should have earned a minimum of 50% credits in all courses up to semester 2.
- 5.4 Promotion from semester 3 to 4: A student should have at least 75% of attendance in aggregate in semester 3. Number of credits earned is not a requirement for this promotion.
- 5.5 Promotion from semester 4 to 5: A student should have at least 75% of attendance in aggregate in semester 4 and should have earned a minimum of 75% credits in all courses up to semester 4.
- 5.6 Promotion from semester 5 to 6: A student should have 75% of attendance in aggregate in semester 5. Number of credits earned is not a requirement for this promotion.
- 5.7 A student shall be required to appear in mid-semester, wherever applicable, as well as end-semester examination of all the courses he/she may repeating for any reason whatsoever.
- 5.8 A promoted student with carry courses shall be required to clear all those courses in the subsequent semester and earn requisite number of credits.
- 5.9 A student has not been promoted to the next semester will have to appear at the end semester examination with the students of next batch. He/she will have to take both the mid semester and end semester examination.
- 5.10 Final result and the award of the degree shall only be given after clearing all papers of all end-semester examination as well as internal assessment examinations.

Marks to be awarded as follows:

- > 20% of marks of Regularity of attendance.
- > 60% of marks for Active participation in classes/ camps/ games/ special camps/ programmes in the college/ District/State/University activities.
- > 10% of marks for exemplary awards/certificates/prizes.
- > 10% of marks for other social components such as Blood Donations, Fine Arts, etc.

2. Requirements to appear for the Examinations: As per the Patna University Act.

3. Scheme of examination

- i. BFE examination is conducted only for 3 hours irrespective of total marks allotted for the examinations.

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- ii. There shall be theory examinations at the end of each semester, for odd semesters in the month of December; for even semesters in May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed course(s) in the subsequent examinations to be held in December or May.
- iii. All candidates admitted in first year, should get registered for the first semester examination, compulsorily. If registration is not possible owing to any reason including shortage of attendance less than 55% beyond condonation limit or on medical grounds, the candidates are permitted to rejoin the course in the next year.
- iv. The results of all the examinations will be published through the University where the student underwent the course as well as through University Website.

4. **Restrictions to appear for the examinations**

Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers as long as the transitory provision is applicable.

5. **Passing Minimum**

- 5.1 A candidate shall be declared to have passed the whole examination, if the candidate passes in all the theory papers and practical wherever prescribed as per the scheme of examinations by earning 148 credits in all semesters. He / She shall also fulfil the extension activity prescribed by earning 1 credit to qualify for the degree in addition to 148 credits and additional paper opted by the Students.
- 5.2 A candidate should get not less than 45% in the University (external) Examination, compulsorily, in BBA. Also the candidate who secures not less than 45% marks in the external as well as internal (CIA) examinations put together in the said shall be declared to have successfully passed the examination in the subject. The candidates who absents himself for CIA programmes, after a repeated chance, will be awarded zero mark in the concerned subject.

6. **Distribution**

Table - I(A): The following are the distribution of marks for external and internal for University (external) examination and continuous internal assessment and passing minimum marks for BFE Programme.

Uni. Exami. Total (ESE)	Passing Minimum for Uni. Exam	CIA Total	Passing Minimum for CIA	Total Marks Allotted	Passing Minimum (Uni. Exam+CIA)
70	32	30	14	100	45

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B.A. (Hons) in Functional English

Core Paper (14 Papers)

- CORE1- Linguistics - I
- CORE 2- Remedial Grammar
- CORE 3- Applied Grammar
- CORE 4- Business English
- CORE 5- Linguistics - II
- CORE 6- Conversational Skill
- CORE 7- Language Learning and Language Teaching
- CORE 8- Feature Writing with Project Work
- CORE 9- Introduction to Drama in English
- CORE 10- Communication
- CORE 11- Broadcasting : Radio
- CORE 11- Broadcasting : TV
- CORE 13- Journalism
- CORE 14- Project Work

Ability Enhancement Compulsory Course (AECC)

1. Rashtra Bhasha Hindi (AECC 1)
2. Environmental studies (AECC 2)

Skill Enhancement Course (SEC) (Choose any)

1. Fundamental of Computer (SEC 1)
2. Entrepreneurship Development (SEC 2)
3. Business Communication

Generic Elective (GE) (Choose any 1)

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1. English (GE1, GE3)
2. Economics / History (GE2, GE4)

Discipline Specific Elective (DSE)

1. Literary Criticism (DSE-1)
2. Translation Theory and Practice (DSE-2)
3. Indian Writing in English (DSE-3)
4. Indian Poetry in English (DSE-4)

Detailed Syllabus (Semester wise) and the Scheme of Examinations

Semester-I

Course / Paper Code	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
CORE-1	BFE 101 : Linguistics -- I	6	5	1	100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-2	BFE 102 : Remedial Grammar	6	5	1	100	30	70	45% in CIA 45% in ESE	Marks decide class
AECC-1	BFE 103 : Rashtra Bhasha Hindi	4			100	30	70	45% in CIA 45% in ESE	Marks decide class
GE-1	BFE 104 : English	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
		22			400	120	280		

Semester-II

Course / Paper Code	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
CORE-3	BFE 201 : Applied Grammar	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-4	BFE 202 : Business English	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
AECC-2	BFE 203 : Environmental Studies	4			100	30	70	45% in CIA 45% in ESE	Marks decide class
GE-2	BFE 204 : Economics / History Subsidiary	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
		22			400	120	280		

Semester-III

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	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
AE-5	BFE 301 : Linguistics II	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-6	BFE 302 : Conversational Skill	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-7	BFE 303 : Language Learning and Language Teaching	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
SEC-1	BFE 304 : Fundamental of Computer	4			100	30	70	45% in CIA 45% in ESE	Marks decide class
GE-3	BFE 305 : English Subsidiary	6							
		28			400	120	280		

Semester-IV

Course / Paper Code	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
CORE-8	BFE 401 : Feature Writing with Project	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-9	BFE 402 : Introduction to Drama in English	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-10	BFE 403 : Communication	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
SEC-2	BFE404 : Entrepreneurship Development	4			100	30	70	45% in CIA 45% in ESE	Marks decide class
GE-4	BFE 405 : Economics / History Subsidiary	6							
		28			400	120	280		

Semester-V

Course / Paper Code	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
CORE-11	BFE 501 : Broadcasting : Radio	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
CORE-12	BFE 502 : Broadcasting : T.V.	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
DSE-1	BFE 503 : Literary Criticism	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
DSE-2	BFE 504 : Translation Theory and Practice	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
		24			400	120	280		

Semester-VI

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	Name of Course / Paper	Credits	Theory	Practical / Tutorial	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
43	BFE 601 : Journalism	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
44	BFE 602 : Project Work	6			100	30	70 (Project + Viva)	45% in CIA 45% in ESE	Marks decide class
45	BFE 603 : Indian Writing in English	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
46	BFE 604 : Indian Poetry in English	6			100	30	70	45% in CIA 45% in ESE	Marks decide class
		24			400	120	280		

Examination

6. A student shall be awarded B.A. (Hons.) Degree in Functional English after the completion of the course according to the following examination structure:

- Name of the Examination – B.A. (Honours) in Functional English
- Duration of Course in year – Three years (Semester I to VI)
- Minimum percentage of marks for passing in Honours

1st class – 60 per cent marks in aggregate of Honours papers.

2nd class – 45 per cent marks in aggregate of Honours papers

Provided that a candidate must have obtained 45 per cent of marks each in Theory and Internal Assessment/Practical/Project Work separately.

- A candidate obtaining 75 percent marks or above in Honours papers shall be declared to have passed B.A. (Hons.) in Functional English in First Class with Distinction in Honours.

Award of Degree

Each successful candidate at the B.A. (Hons.) in Functional English (~~Vocational~~) Examination shall receive, in token of his/her degree, a certificate in prescribed form specifying the name of the university and the class in which he/she was placed.

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GOVERNOR'S SECRETARIAT, BIHAR
RAJ BHAVAN, PATNA-800022

Letter No.-PU(Regulation)-08/2005(Part)- /GS(I), Dated-

From,
R.V.S. Parmar,
Law Officer-cum-Incharge OSD(J)

To,
The Registrar,
Patna University,
Patna.

Sub:- Regarding approval of the Ordinance and Regulations under Choice Based Credit System (i) B.A. (Hons.) in Mass Communication (ii) Bachelor of Business Administration (Hons.) (iii) B.A. (Hons.) in Computer Applications (iv) B.Sc. (Hons.) in Biotechnolgy (v) B.Sc. (Hons.) in Computer Applications (vi) B.A. (Hons.) in Functional English, a self-financing programme to be effective from the session 2019-2022 onwards.

Sir,

I am directed to invite a reference to the University's Letter No.- Acad/9209, Letter No.- Acad/9293, Letter No.- Acad/9183, Letter No.- Acad/9203, Letter No.- Acad/9185, Letter No.- Acad/9199, all dated 16-10-2019 on the subject mentioned above and to inform that the Hon'ble Chancellor after due consideration of the proposal of the University and advice of the Advisory Committee and in exercise of the powers vested in him u/s 38(2) and 39(2)(ii) of Patna University Act, 1976 as amended up to date, has been pleased to approve the draft Ordinance and Regulations of the following courses under self-financing programme to be effective from the session 2019-2022 and onwards:-

- (i) B.A. (Hons.) in Mass Communication
- (ii) Bachelor of Business Administration (Hons.)
- (iii) B.A. (Hons.) in Computer Applications
- (iv) B.Sc. (Hons.) in Biotechnolgy
- (v) B.Sc. (Hons.) in Computer Applications
- (vi) B.A. (Hons.) in Functional English

However, Ordinance and Regulations if any, approved earlier in respect of the above courses /programmes shall deem to be **repealed** to the extent aforesaid.

Further necessary action may kindly be taken accordingly.

Encl:-As above.

Yours faithfully,
Sd/-

(R.V.S. Parmar)
Law Officer-cum-Incharge OSD(J)

PATNA UNIVERSITY

**ORDINANCE
&
REGULATION**

for

The 3yr (Six Semester)
Under Graduate Degree Programme
Bachelor in Business administration (Hons)
in the faculty of Commerce
under

CHOICE BASED CREDIT SYSTEM (CBCS)
(To be effective from 2019 - 20)

Dr. Subhi
16-12-19

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बिहार, पटना-800022
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PATNA UNIVERSITY

ORDINANCE

The 3 year (Six Semester) Under Graduate Degree Programme Bachelor in Business administration (Hons)

B.BA. in the faculty of commerce
Under

CHOICE BASED CREDIT SYSTEM (CBCS)

PREAMBLE:

The CBCS provides an opportunity for the students to choose courses from the prescribed list of courses comprising core, elective and ability enhancement courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students of universities of Bihar to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. The Universities shall follow the guidelines formulated by the UGC in order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

The Under Graduate degree programme for subjects under Faculty of commerce shall be of six semesters spread over three years duration. The programme shall be named as the 'Bachelor of Business administration Honours' programme and shall be abbreviated as B.BA (Hons).

1. General

- 1.1 The ORDINANCE and the REGULATIONS shall be called the 'Admission Ordinance' and 'Regulations of Examination' for Under-Graduate degree courses to be applicable in Patna University.
- 1.2 The programme may be run in any college/ department / centre under Patna University.
- 1.3 These ordinance and regulations shall be effective from the academic session 2019-20 & onwards.
- 1.4 The B.BA programme shall consist of 26 papers spread over six semesters consisting of Core Courses (CC), Generic Courses (GE), Discipline Specific Elective



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बिहार, पटना-800022

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Courses (DSE), Skill Enhancing Courses (SEC) and Ability Enhancing Compulsory Courses (AECC) as described in Table. 1. There shall be four (04) courses/ papers in 1st semester, four (04) courses/papers in 2nd semester, five (05) courses/papers in 3rd semester and five (05) courses/papers in 4th semester; four (04) courses/papers in 5th semester and four (04) courses/papers in 6th semester each course carrying 100 marks. The entire curriculum shall be of 2600 marks taken together. However, the CGPA/class shall be awarded on the performance of the candidate on 18 papers which includes the 14 CC papers and four (04) DSE papers having an aggregate of 1800 marks. The various types of courses under CBCS are defined in section 3.

2. The Core/ Major subject:

The Under Graduate Degree 'Bachelor of Business administration Honours' [B.BA. (Hons)] in the Faculty of Commerce shall be offered with the Core subject / major subject as Computer Applications.

3. OUTLINE OF THE CHOICE BASED CREDIT SYSTEM (CBCS):

It consists of a number of courses i.e. **Core Course (CC), Generic Elective Course (GE), Discipline Specific Elective Course (DSE), Skill/ Ability Enhancement Courses (SEC), and Ability Enhancement Compulsory Courses (AECC)**. Each course is equivalent to a paper. The nature of these courses is defined below:

3.1.1. Core Course (CC):

A course which should compulsorily be studied by a candidate as a core requirement on the basis of subject of B BA studies and is termed as a Core course.

3.1.2. Discipline Specific Elective Course (DSE):

Elective courses may be offered by the main discipline/subject of study is referred to as **Discipline Specific Elective**. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

3.1.3 Generic Elective Course (GE):

An elective course chosen generally from an unrelated discipline/subject, with an intention to seek wide exposure is called a **Generic Elective**.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and *vice versa* and such electives may also be referred to as Generic Elective.



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3.1.4 Skill Enhancement Courses (SEC):

The Skill Enhancement Courses (SEC). "SEC" courses are the courses based upon the content that leads to life skill enhancement.

3.1.5 Ability Enhancement Compulsory Courses (AECC):

University will run a number of Ability Enhancement Compulsory Courses (AECC) which is qualifying in nature and student from all faculties have to qualify in all such courses.

3.1.6 Dissertation/Project/ Internship/ Industrial Training:

An elective course designed to acquire special/advanced knowledge, such as supplement /support study through a project work. A candidate studies such a course on his/her own with an advisory support by a teacher/faculty member, is called dissertation/project. Student may join an Industrial/ Service Sector/ Research organization to acquire hands on training and/ or research training.

3.2 CREDIT

The total Credit for completing a UG programme is 148.

The details of credits for individual components and individual courses are mention below & given in Table.1.

Table 1: Structure of the 3 Yrs (Six Semester) Under Graduate Degree Programme under Choice Based Credit System (CBCS):

Semester	No of COURSE / Papers	Credit per COURSE/ paper	Total credit	Minimum No of Learning Hours#	No of CORE COURSE/ PAPER	No of ELECTIVE Course/ PAPER	Code & Nature of Elective Course/ paper
I	04	2X06 1X06 1X04	22	220	2	2	GE-1 AECC-1
SEMESTER BREAK							
II	04	2X06 1X06 1X04	22	220	2	2	GE-2 AECC-2
SEMESTER BREAK							
III	05	3X06 1X06 1X04	28	280	3	2	GE-3 SEC-1
SEMESTER BREAK							
IV	05	3X06 1X06 1X04	28	280	3	2	GE-4 SEC-2
V	04	2X06 2X06	24	240	2	2	DSE-1 DSE-2

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VI	04	2X06 2X06	24	240	2	2	DSE-3 DSE-4
Total	26		148	1480	14	12	

#For Tutorial (T)/ Practical (P)/ Field Work (FW)/ Internship etc. extra working hour to be added as per requirement and will be decided by the BOCS of the respective subject.

- Discipline Specific Elective Courses (DSE 3 & DSE 4) to be studied in 6th semester may be

Both theory papers
/ One Theory paper and One Practical paper
/ One Theory paper and One Project work
/ One Theory paper and One Field work
/ Both Project work/ Internship

IMP : It is desirable that all students of all courses be given adequate exposure over and above the class room teaching to enhance the scope of employability.

3.2.1. The distribution of the ten elective papers shall be – two (02) SEC, Four (04) GE, four (04) DSE. Students may opt for any elective course out of a list of elective papers (Basket) offered by the University/ parent department or any other department/s as per his/her choice with the prior permission of the parent department. The list of elective papers, syllabus and prerequisite of the elective course will be as decided by the Board of Courses of Studies (BOCS) of the concerned subject/ department.

3.2.2. The final CGPA/ class will be decided on the performance of the student in the 18 courses/ papers including the 14 Core Courses (CC) / papers and 04 DSE papers.

3.2.3 The four (04) GE courses, two (02) AECC, two (02) SEC courses/ papers will be qualifying in nature and a student has to score at least 45% marks in these papers. Grade will be awarded separately for these courses, however, performance in these courses/ papers shall not be considered for awarding the final CGPA.

3.2.4 Ability Enhancement Compulsory Courses (AECC):

University will run two Ability Enhancement Compulsory Courses (AECC) which are qualifying in nature and a student has to qualify in both these courses. The courses are:

Table. 2 : Ability Enhancement Compulsory Courses (AECC 1 & AECC 2)

AECC-1 : Language Proficiency (English/ Hindi) (4 Credit)

AECC- 2 : Environmental Sustainability (4 Credit)

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Students may be encouraged to do assignments/project work related to institutional social responsibilities including Swachchha Bharat Abhiyan Activities during Semester as well as SEMESTER BREAK.

3.2.5 University will run a number of **Skill Enhancement Courses (SEC)**: as mentioned in Table.3 below; a student can choose one from these in Sem III and one in Sem IV.

Table. 3 : Basket of Skill Enhancement Courses (SEC 1 & SEC 2)

- Computers and IT Skill
 - Web Designing
 - Food Processing Technology
 - Mushroom Culture
 - Environmental Law
 - Financial Risk Management
 - Solid Waste Management
 - Retail Management
 - Tourism & Hospitality Management
 - Life skill & skill development
 - Yoga Studies
 - WEATHER FORECASTING
- Or any course from MOOC/NPTEL/SWAYAM approved by the BOCS

3.2.6 Generic Elective (GE) Course:

University will run a number of **Generic Elective Courses (GE)** as mentioned in Table.4. below. A student can choose one from these.

Table 4: Basket of GE courses

- Psychology
- Indian National Freedom Movement
- Statistics
- conservation of natural resource
- Environmental Law
- Indian Polity
- Economics
- Social anthropology
- Disaster Management
- Inclusive Policies
- Human Rights
- Indian Physical Geography
- Advance English Any other course offered by SWAYAM/NPTL/MOOC & approved by the BOCS

3.2.7 Discipline Specific Elective (DSE):

A student may select as a DSE paper from a set of courses run by the department.

Table 5:

Table 5: Basket of DSE courses
1. Management of Industrial relations
2. Training and Development management
3. Financial Services
4. Investment Management
5. Marketing Research
6. Rural Marketing Research
7. Change Management
8. Reward Management
9. Financial Institutions Market
10. Tax Planning and market
11. Sales and advertising management

4. ELIGIBILITY CRITERIA for ADMISSION in Bachelor in Business Administration (Hons) Programme :

4.1 A candidate seeking admission to B.BA. (Hons) programme must have passed/ appearing the Intermediate in Science/Arts/Commerce (I.Sc./I.A/I.com) examination in any stream of Bihar board or 12th examination of 10 +2 system in Science/Arts/Commerce stream by any other approved board (CBCS/ ISC/ other state boards etc.).

4.2 Admission to B.BA. Part-I (First Semester), shall be made in order of merit. The merit list shall be prepared on the basis of marks obtained by an applicant in the Admission Entrance Test (AET) to be conducted by the University/ College.

AET will consist of written test of 100 marks and interview carrying 20 marks. The final merit list shall be prepared on the basis of the performance of the applicant in the written test and the interview in the AET i.e. on 120 marks.

4.3 A merit list will be first prepared for different category of candidates on the basis of marks obtained in the written test (AET Written).

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The candidates within only 3 times the actual number of seats available for each category will be called for appearing in the Interview.

- 4.5 Final merit list will be prepared on the basis of total marks obtained in written test and the interview i.e. on 120 marks.
- 4.6 Only those candidates selected on the basis of performance in the AET and passed with 45% marks in the aggregate and pass in all subjects in 12th level examination will be admitted.

5. The Admission Entrance Test (AET)

AET will consist of written test of 100 marks and interview carrying 20 marks. The final merit list shall be prepared on the basis of the performance of the applicant in the written test and the interview in the AET i.e. on 120 marks.

5.1 Structure of the Admission Entrance Test AET (Written):

Questions shall be of multiple choice type with four options with a single correct answer. The entrance test shall be held on OMR sheet. The duration of the test shall be of 2:00 hour. The total marks will be 100 marks. There shall be no negative marking. There shall be five parts in the question paper as mentioned in Table.6.

Table.6. Details of entrance test

Part A	General Aptitude Test & Reasoning	20 marks	20 questions	1 mark for each question
Part B	English Language Proficiency	20 marks	20 questions	1 marks for each question
Part C	Elementary Mathematics	35 marks	35 questions	1 mark for each question
Part D	General Science :	20 marks	20 questions	1 marks for each question
Part E	General knowledge	05	5 questions	1 marks for each question

- 5.2 The application fee for applying for admission to B.BA. (Hons) programme will be Rs.750/- only. This will include the fee for admission entrance test and the cost of the prospectus.

On the recommendation of the Academic Council and with the approval of the statutory bodies of the respective university, application fee may be revised whenever required.

6. No. of seats

At present the number of seats available in B BA (Hons) in Business administration in various colleges of Patna University are as follows :

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na Women's College (An Autonomous College) – 60, Magadh Mahila College – 60
 Patna College, Patna - 60 , Bihar National College - 60

Any change in the number of seats in a particular subject shall be decided by the respective University in accordance with the guidelines received from the State Government from time to time.

7. Reservation of Seats

- i. The reservation of seats in each programme shall be as per reservation rules of the Government of Bihar.
- ii. Reservation for Persons with Disabilities (PwD) candidates will be followed as per notification of the Government of Bihar issued from time to time.
- iii. 2% seats of the sanctioned strength in any subjects may be filled with NRI/Foreign students. These seats will be treated as over and above the normal sanctioned strength. NRI candidates under this category shall submit their applications duly recommended by M.E.A. (Ministry of External Affairs) along with the copies of the documents showing NRI status. NRI candidates will be exempted from the written test. However, they have to appear in before the Interview board.
- iv. A candidate seeking admission against under various reserved category i.e. SC/ST/EBC/ OBC/WBC/EWS etc. has to mention about the category to which he/she belongs to at the time of submitting the main admission application form and attach the supporting document to substantiate his/ her claim. Applications received separately later on shall not be entertained.
- v. No student shall be entertained to weightage for the purpose of admission under special quota.

8. No applicant shall be admitted to the programme who has not applied for admission within the notified time period.

9. The admitted students will have to register themselves with the Patna University to be able to appear in the Patna University examination within the stipulated period to be notified by the University at the time of admission.

10. During the tenure of the course, if it is found that any document/documents or submission made by a student in support of his/her admission to B.BA. (Hons) programme is/are forged or fake, his/her admissions shall automatically stand cancelled. The concerned candidate shall be solely responsible for the cancellation of his/her admission and other punitive action/actions. The fee deposited by the candidate will be forfeited.




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The Vice Chancellor of the respective University has the absolute right to reject /deny admission to any candidate without assigning any reason if he/she judges that this is in the best interest of the University.

12. No candidate shall be allowed to register for any other degree programme in the same University or any other university during the same academic session of his/her study of B.B.A. (Hons) programme in Business administration.

14. Medium of Instruction/Teaching

Medium of instruction for teaching-learning is English.

The examination question paper will be in English and a student has to present answer in English.

15. Fee Structure

The Fee Structure for the B.B.A. (Hons) programme shall be as mentioned in Table 7.

16. If need arises, the University with the approval of relevant Statutory bodies and the Governor's Secretariat may modify / add or delete any provision of this ordinance.

Table 7: FEE STRUCTURE PER YEAR (For two Semesters)

For Under Graduate Degree Bachelor in Business Administration (Hons) under

Self Financing mode :

Tabl.2: FEE STRUCTURE PER YEAR for Bachelor in Business Administration (Hons)

Sl. No.	Fee Structure	BBA-I	For NRI	BBA-II	For NRI	BBA-III	For NRI
1.	Admission Fee	200	400	200	400	200	400
2.	Registration Fee (one time)	200	400	--	--	--	--
3.	Tuition Fee	6000	12000	6000	12000	6000	12000
4.	Library	2500	5000	2500	5000	2500	5000
5.	Development charges *	5000	10000	5000	10000	5000	10000
	Examination fee	1000	2000	1000	2000	1000	2000
7.	Maintenance	1500	3000	--1500	3000	--1500	3000
8.	Common Room	400	800	--400	800	--800	1600
9.	Identify card (one time)	50	100	--	--	--	--
10.	Extra- Curricular Activities	1500	3000	--500	1000	--500	1000
11.	Miscellaneous Charges	1500	3000	--1500	3000	--1500	3000

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2.	Electricity Charges (per annum)*	600	1200	600	1200	600	1200
14.	Syllabus, Handbook & College Magazine	250	500	--250	500	--250	500
15.	Environment Protection	200	400	--200	400	--200	400
17.	NSS (per annum)	20	40	20	40	20	40
18.	Eklaya, Tarang (per annum)	20	40	20	40	20	40
19.	Industry Tour			--		--1800	3600
20.	Caution Money (Refundable)	3000	6000	--		--	
21.	Soft skill	800	1600				
22.	First aid	100	200				
	Total	24840	49680	18690	37380	20490	40980

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बिहार, पटना-800022

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PATNA UNIVERSITY

REGULATION

The 3 year (Six Semester) Under Graduate Degree Programme

Bachelor in Business Administration (Hons)

in the faculty of commerce under

CHOICE BASED CREDIT SYSTEM (CBCS)

1. General

- 1.1 These regulations shall be called the "Regulations of Examination" for **Bachelor in Business Administration (Hons)**
- 1.2 These regulations shall come into force from the academic year 2019-2020.

2. Programme of Study

- 2.1 The University shall offer **Bachelor in Business Administration (Hons)** (degrees in the Faculty of Commerce.
- 2.2 The durations of **Bachelor in Business Administration (Hons)**
- 2.3 (CBCS System) programme shall be of six semesters spread over three academic years. Each semester shall be of ninety teaching days.
- 2.4 Each academic session shall consist of two semesters
 - Odd Semesters (I, III, V) from July to December
 - Even Semesters (II, IV, VI) from January to June.
- 2.5 **Bachelor in Business Administration (Hons)** programme Course shall consist of 26 papers spread over six semesters. There shall be four (04) papers in first semester, four (04) papers in second semester, five (05) papers in third semester and five (05) papers in fourth semester, four (04) papers in fifth semester and four (04) papers in sixth semester carrying 100 marks in each paper. The entire curriculum shall be of 2600 marks taken together. However, the class shall be awarded on the performance of the candidate on 18 papers including 14 CC and four (04) DSE papers having an aggregate of 1800 marks.
- 2.6 The eight (08) elective papers - two (02) AECC, two (02) SEC and four (04) GE will be qualifying in nature. A student shall not be considered pass and eligible for award of the final degree unless he/she obtains minimum qualifying marks in these eight papers. A complete description of papers is given in table 1.
- 2.7 The distribution of papers like theory, practical, field work, project, internship, dissertation etc. with number of credits is specified in the syllabus of each subject/ programme and made available to the student by the respective department.
- 2.8 The term 'credit' means weightage given to a course in relation with the instructional hours assigned to it. One credit will generally consist of ten hours of instruction. The **Bachelor in Business Administration (Hons)** programme shall

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be of 148 credits divided as 22 credit in first semester, 22 credit in second semester, 28 credit in third semester, 28 credit in four semester, 24 credit in fifth semester and 24 credit in sixth semester. The number of credit for each paper of the Bachelor's degree programme shall be specified in the syllabus of the subject concerned.

Table. 1. Description of papers for Bachelor in Business Administration (Hons) degree in the faculty of commerce under CBCS

Semester	Course/ Paper Code	Nature of Course/ Paper	Marks	Marks of CIA	Marks of ESE	Passing criterion	Qualifying Criterion
SEMESTER I	CC-1	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-2	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
SEMESTER II	GE-1	Generic Elective	100	30	70	45% in CIA 45% in ESE	Qualifying
	AECC-1	Ability Enhancing Compulsory	100	30	70	45% in CIA 45% in ESE	Qualifying
	CC-3	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-4	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	GE-2	Generic Elective	100	30	70	45% in CIA 45% in ESE	Qualifying
	AECC-2	Ability Enhancing Compulsory	100	30	70	45% in CIA 45% in ESE	Qualifying
	CC-5	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-6	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-7	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	GE-3	Generic Elective	100	30	70	45% in CIA 45% in ESE	Qualifying
SEMESTER III	SEC-1	Skill Enhancement Course (Elective)	100	30	70	45% in CIA 45% in ESE	Qualifying
	CC-8	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-9	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
	CC-10	Core Course Subject related	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA

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Compulsory						
GE-4	Generic Elective	100	30	70	45% in CIA 45% in ESE	Qualifying
SEC-2	Skill Enhancement Course (Elective)	100	30	70	45% in CIA 45% in ESE	Qualifying

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CC-11	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
CC-12	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
DSE-1	Discipline specific elective	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
DSE-2	Discipline specific elective	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
CC-13	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
CC-14	Core Course Subject related Compulsory	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
DSE-3	Discipline specific elective	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA
DSE-4	Discipline specific elective	100	30	70	45% in CIA 45% in ESE	Marks decide class/ CGPA

3. Evaluation of Performance Under CBCS

3.1 The performance of a student in each paper will be assessed on the basis of a Continuous Internal Assessment (CIA) of 30 marks and the End of Semester Examination (ESE) consisting of 70 marks.

3.2 The components of C.I.A. are follows :

- (i) Two mid-semester written tests of one hour duration each (2X7.5)= 15 Marks
- (ii) Seminar /Quiz/ Presentation = 05 Marks
- (iii) Assignment = 05 Marks
- (iv) Attendance and conduct = 30 Marks

Total

3.3 The components of C.I.A. in papers having practical shall be as follows:

- (i) Two mid-semester written tests of one hour duration each (2X5)= 10 Marks
- (ii) Practical Record Book = 05 Marks
- (iii) Seminar/Quiz/ Presentation = 05 Marks
- (iv) Attendance and conduct = 30 Marks

Total

3.4 The concerned teacher of the course/paper shall be responsible for conducting the mid-semester tests and other components of the CIA.

3.5 The ESE will be written examination of 3-hours duration conducted by the University.

3.6 The evaluation of laboratory paper and field work, wherever applicable will also be based on CIA and an end-semester practical examination.

3.7 The ESE practical examination examinations of 3-hours duration will be conducted by the University.

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- 3.8 All such examination shall be as per the provisions of examination board and moderation board of the Patna University.
- 3.9 Only those students who secured minimum qualifying marks in of 45% in the CIA shall be allowed to fill up the End Semester Examination form.
- 3.10 The marks of CIA in each paper be submitted by the Department along with the End semester Examination form failing which the student may not be issued admit card for the examination.

4. Examinations :

- 4.1 The End-Semester-Examination will be conducted by the University. The Mid Semester examinations and other components of CIA shall be conducted and evaluated by the concerned departments/ College.
- 4.2 The practical examinations wherever applicable shall be conducted at the department/ College. The Director/ Coordinator of the Programme will appoint external examiner(s) for End Semester Practical Examination with the approval of the University. The mid-semester tests and Practical Record Book will be conducted and evaluated by the concerned teacher.
- 4.3 The answer scripts of the mid-semester tests shall be shown to students by the concerned teacher.
- 4.4 The End of Semester Examination (ESE) shall be named as follows:
- (a) Part (I) - Semester I Examination
and Semester II Examination respectively
- (b) Part (II) - Semester III Examination
And Semester IV Examination respectively
- (c) Part (III) - Semester V Examination
Semester VI Examination respectively
- (d) Syllabus for each paper shall be divided into at least 5 units. Based on this, the question paper pattern for the End Semester Examination shall have divided into three parts A, B, C comprising of objective type questions with multiple choice, short answer type questions and long answer type questions respectively as mentioned in Table.2 below :

Table. 2 : (Questions shall be picked up from the whole syllabus)

Part	Nature of questions	Number of questions to be asked	Number of questions to be answered	Marks of each question	Total marks
Part-A	i. Objective type questions with multiple choice	05	05	01	10
	ii. Fill in the blank	05	05	01	20
Part-B	Short answer type questions [To be answered in not more than 200 words]	06	04	05	40
Part-C	Long answer type questions	06	04	10	40
Total Marks					70

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Part – A

Ten Questions - All questions to be answered

Q.1. Multiple Choice Type

(Preferably one question from each unit) $1 \times 5 = 05$ marks

Q.2. Fill in the Blank

(Preferably one question from each unit) $1 \times 5 = 05$ marks

Part-B

Six short Answer Questions – Four questions to be answered

(Questions shall be picked up from the whole syllabus preferably one question from each unit) $5 \times 4 = 20$ marks

Part – C

Six long answer Questions – Four questions to be answered

(Questions shall be picked up from the whole syllabus preferably one question from each unit) $10 \times 4 = 40$ marks

(e) In the courses/papers with PRACTICAL component the distribution of marks will be –

CIA - 30 marks

ESE (written) - 50 marks

ESE (Practical) - 20 marks

(f) The ESE written paper, the pattern will be as mentioned in the Table. 3 below :

Table.3.

Part	Nature of questions	Number of questions to be asked	Number of questions to be answered	Marks of each question	Total marks
Part-A	i. Objective type questions with multiple choice	05	05	01	10
	ii. Fill in the blank	05	05	01	
Part-B	Short answer type questions [To be answered in not more than 200 words]	04	02	05	10
Part-C	Long answer type questions	05	03	10	30
Total Marks					50

4.5 The examination of I, III, V semesters, shall be generally held in the month of November-December and that of II, IV, VI semester shall be held in the month of May-June.

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- 4.6 In formulating the entire programme of studies, each Department shall be guided by the consideration that at the graduate level, students should be familiar with all the sub-disciplines, trends and paradigms of the subject contributing to the knowledge pool and also the value education and employability factor. Keeping this in view the Department will decide subject based 14 core papers, 4-DSE papers and other 4- Generic electives papers.
- 4.7 Paper Setting: For ESE, 50% examiners will be engaged from outside the university by the parent University as per the provisions of the examination board.
- 4.8 In Subjects, where there is Practical/ Project/ Field Study /Internship/ Dissertation etc. the distribution of marks for CIA and ESE for such papers shall be decided by the Board of Courses and Study (BOCS) of the respective subject with the approval of the University and details mentioned the syllabus for which up to 50% marks may be for CIA and 50% marks for ESE.
- 4.9 All practical papers shall be evaluated by two examiners – one internal and one external. The distribution of CIA marks in practical papers shall be as per the course structure.

5. Passing of Examinations and Promotions Rules

Promotion Rules

- 5.1 There shall be no supplementary examination in any of the papers in any semester. (I, II, III, IV, V and VI).
- 5.2 The candidates who have been admitted to the First Semester of a three year Under graduate Programme in a session can be placed in the following categories on the basis of their attendance in the Semester.
- Those who have cleared the CIA and attended the required minimum percentage (75%) of attendance of lectures/practical classes separately.
 - Those who have not attended the required minimum percentage of attendance (75%) both in Theory and Practical shall in no case be permitted to appear in the End Semester Examination.
- 5.3 After appearing at the Semester Examination, the candidates can be placed in following categories in the context of declaration of the results of the Semester Examination (ESE):
- To be declared passed in End Semester Examination in any subject, a candidate must secure at least 45% marks in each paper separately in CIA, theory and practical, wherever applicable.
 - If a candidate secures 45% marks in at least 50% papers in his/her CIA and First/ Second/ Third/ Fourth/ Fifth Semester End Semester Examinations (ESE), he/she shall be promoted to next higher semester.
 - Candidates shall have to clear their backlog paper(s) in the next end semester examination of that semester whenever it is available.
 - Even if a student is promoted to Sixth Semester, his/her final result will only be declared when he/she has cleared all the backlog papers.
 - Final result of **Bachelor in Business Administration (Hons)** programme shall be published on the basis of candidate's performance in the 18

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papers spread over six semesters provided he/she has passed with minimum qualifying marks of 45% in the AECC, SEC and GE papers/ courses of each semester.

- (vi) The Final result will be published only after he/she has cleared all the 26 papers securing minimum qualifying marks.
- (vii) Since it is a continuous evaluation programme, student shall be awarded Grade Point (GP) at the End of each Semester Examination and Cumulative Grade Point (CGP) at the End of Final End Semester Examinations in 10 point scoring system.
- (viii) There shall be no supplementary examination. A student has to score minimum 45% marks in his CIA. Failing to secure minimum marks he/she shall have to repeat the CIA along with the students of the same semester of the next academic session.
- (ix) If students fail to secure minimum 45% marks in CIA of any paper his/her result will be declared as failed in that paper. Students shall have to reappear in that paper in the same semester of next academic session.
- (x) The name of the promoted candidate/candidates will not be included in the merit list of that subject.
- (xi) A promoted candidate, if he has passed in CIA but fails in theory paper/papers, he/she shall retain his/her CIA score and will reappear in the theory paper only of the semester whenever available. However, if a candidate is declared fail in any End Semester Examination, he/she shall retain nothing and will have to redo the course work of failed semester again and he has to appear again in CIA as-well-as ESE - written and practical (if applicable) examination.
- (xii) The Candidates who were declared as sent up but did not fill up the examination form will appear in the next examination as ex- candidates (Non - Collegiate)
- (xiii) Fill-up the form but did not appear in the examination, the candidate will be declared as fail. Fill-up the form but did not appear in the examination, the candidate will be declared as fail. The Candidates who were declared as sent up but did not fill up the examination form will appear in the next examination as ex- candidates (Non - Collegiate)
- (xiii) Fill-up the form but did not appear in the examination, the candidate will be declared as fail.

6. Improvement of Result :

If candidate passes in End Semester Examination (ESE), he/she may apply for the improvement of his/her result in maximum of two papers of the sixth semester. He/she can avail this facility only in theory papers. Better of the two results will be treated as final result of candidates in those papers. However, the name of such candidates with improved result will not be included in the merit list.

7. Declaration of Result :

The following grading system shall be used by Teacher/Examination department:

Letter Grade	Percentage Range	Numerical of Letter	Description of Grade
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		Grade	
O	>100-91	10	Outstanding
A++	90-81	9	Excellent
A+	80-71	8	Very Good
A	70-61	7	Good
B+	60-51	6	Average
B	50-45	5	Pass
F	Less than 45	Less than 5	Fail

(Note: value 0.5 or more should be rounded off to 01)

8. Examinations :

The End Semester Examinations (ESE) shall be conducted by the University. The continuous Internal Examinations (CIA) shall be conducted by the concerned department.

9. Passing of Examination :

9.1 A student shall be declared to have 'passed' and promoted to the next semester when he/she earns at least 'B' grade or above grade as mentioned in the table in section 7 in the semester examination covering continuous evaluation, mid-term and end-term examinations in all the programme for which he/she was registered in the said semester.

- In order to be promoted from Semester I to Semester II, a candidate has to pass in at least 50% of courses in Semester I Examinations.
- In order to be promoted to the Semester III, a candidate needs to pass in at least 50% of courses of Semester I and 50% of courses of Semester II.
- In order to be promoted to the Semester IV, a candidate must clear all papers of semester I, at least 50% of courses of semester II and 50% of courses of semester III.
- In order to be promoted to the Semester V, a candidate must clear all papers of semester I and II, at least 50% of courses of semester III and 50% of courses of semester IV.
- In order to be promoted to the Semester VI, a candidate needs to have cleared all papers of Semester I, II, III and 50% of courses of Semester IV and 50% of courses of Semester V
- In order to consider for the award of the Degree in the programme, a candidate has to pass in all papers/ courses of all Semesters.
- A Student passed or promoted to the next Semester shall be entitled to get admitted in the Semester to which he/she has been declared passed/promoted.

9.2 A student shall be entitled to get a maximum number of two (02) extra chances to clear a course/ paper over and above his/her original session.

9.3 A student will be deemed as 'FAILED' in a semester when he/he gets 'F' grade in more than 50% of the papers offered in the examinations to meet the

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requirements. Such students will be advised by the University to repeat the semester on payment of semester fee or the half of the academic year fee.

- 9.4 A student who has secured less than 'B' GRADE in one or more course may also be promoted to the next semester if he/she has not otherwise failed as per section above. However, he/she will have to re-appear at the examination of such courses as and when it is held or at the time of regular End-semester examination (ESE) in which he/she has been promoted.
- 9.5 A student shall be declared to have failed in the programme when he/she fails to qualify for promotion to the next semester after three successive attempts.
- 9.6 Grades that may be shown in the award sheet of a student without any numerical value are N.A (Not Applied) and S.P (Satisfactory Performance) for course(s) extending beyond a semester such as Project Work.
- 9.7 There shall be a Grade Point Average (GPA) calculated for each semester on the basis of grades obtained in that semester. The GPA for the Jth Semester is calculated as :

$$\text{GPA} = \frac{\sum_{i=1}^n m_i o_i}{\sum_{i=1}^n o_i}$$

Where n is the number of course in the Jth semester, m_i denotes the numerical value of the grade obtained in the Jth course of the semester denotes the number of credits for the Jth course of the semester.

Example:

Let us consider the numerical grade and credit of a student given in the table below GPA for Jth semester can be calculated.

Course	Paper I	Paper II	Paper III	Paper IV	Paper V
Credit	5	5	5	5	5
Numerical Grade	7	8	5	7	6

The GPA for the Jth semester is calculated as :

$$\text{GPA} = \frac{7 \times 5 + 8 \times 5 + 5 \times 5 + 7 \times 5}{5+5+5+5} = \frac{135}{20} = 6.75$$

The cumulative Grade Point Average (CGPA) for k semester is given as :

$$\text{CGPA} = \frac{\sum_{j=1}^k (\text{GPA}_j \times C_j)}{\sum_{j=1}^k C_j}$$

where C_j is the total number of credits in the jth Semester.

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For example, consider the GPA's obtain by a student in four semester along with total credit in each semester is given as follows.

Semester	First	Second	Third	Fourth
GPA	6.75	6.00	8.12	7.62
Total Credit	20	20	18	16

$$\text{CGPA} = \frac{(6.75 \times 16) + (6.00 \times 20) + (8.12 \times 18) + (7.62 \times 16)}{16 + 20 + 18 + 16}$$

$$= \frac{108 + 120 + 146 + 16 + 121.92}{70}$$

$$\text{CGPA} = \frac{496.08}{70} = 7.08$$

- 9.8 The award sheet of the students will show the grades obtained in all the courses offered in each semester, grades/categories without numerical value (if applicable), the GPA and the promotion status.
- 9.9 To be eligible for the award of Bachelor Degree, students must obtain a minimum final Cumulative Grade Point Average (CGPA) of 5.0.
- 9.10 To find percent equivalent to CGPA the following formula may be used; percent = CGPA x 9.5
- 9.11 Answer books or sheets will be coded before being passed on to the examiner and decoded before tabulation work.

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Sheel. Sharma
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B.Sc. (Hons.) in Computer Applications

1st Year: Semester I

Course Objectives:

- To gain basic knowledge of digital electronics circuits and its levels.
- To understand and examine the computer architecture and networking.
- To learn about the basic requirements for a design application.
- To understand the logic functions, circuits, truth table and Boolean algebra expression.

CC-1: Computer Fundamentals and Organizations[Credits: 4, Lectures: 60]

Unit 1. Introduction to Computer and Basic anatomy (12 Lectures)

Definitions: Data, Processing, information, Bits, Bytes and Words, Input, Output, CPU, Peripheral Devices, Backing Storage Inputinterface, Output Interface, Microprocessor, RISC, CISC, Types of motherboards Expansion slots, Adaptor Cards, SMPS, Controller Cards, Video – Raster Scanning & interleaved double scan, DISPLAYS – MDA, CGA, HGA, EGA, VGA, SVGA

Unit 2. Classification of Computers and Applications (6 Lectures)

On the basis of generation Micro, Mini, Super, Mainframe, Digital, Analog, Hybrid Applications in Business & Industry, Science & Technology, Education, Health, Communication, Banking & Other Public services, Block Diagram of IBM PC,

Unit 3. Peripheral Devices (12 Lectures)

Input Devices

Keyboard, Mouse, Joystick, Trackball, Touch Panels, OMR, OCR, MICR, Data Glove, Digitizers, Image scanners, Light Pen, Voice system

Output Devices

Printers: Impact printers and non-impact printers, Character Printers, Line Printers and Page Printers, Dot matrix, Daisy wheel, Thermal, LASER, Inkjet, Electrostatic, Drum Printer, Chain Printer

Plotters: Drum and Flat Bed Plotters

VDU: Visual Display Adapters, LCD

Secondary Storage Devices

Magnetic Disk (Winchester and hard disks),

Magnetic Tape, Floppy Disk, Optical (Video or LASER disk), CD

Unit 4. Memory and Register (9 Lectures)

Primary memory, Secondary Memory, Cache memory

RAM-SRAM, DRAM,

ROM-PROM, EPROM, EEPROM, CDROM, ROM BIOS, BUSES

Registers- Program Counter, Memory Buffer register, Memory Address

Register, Accumulator, Cache Memory

Unit 5. Computer Codes and Number system (9 Lectures)

Number System:(i) Positional – Decimal, Binary, Octal, Hexadecimal(ii) Non Positional (Roman), Conversion of Decimal Number in other systems and vice-versa

Binary Arithmetic – Addition, Subtraction (1's complement, 2's complement), Multiplication, Division, Boolean Algebra – BASIC Gates (OR, AND, NAND, NOT, XOR, NOR)

Unit 6. Types of processing and Introduction to Operating Systems (7 Lectures)

(i) Batch Processing(ii) On-line processing(iii) Real-time processing
Operating Systems(OS), Multi-programming, Multitasking, Multiprocessor, Utilities,
Compilers/Interpreters, Assemblers

Unit 7. Networking (5 Lectures)

Topologies(BUS, STAR, RING, MIXED), Advantages and disadvantages of networking,
LAN, WAN, Transmission Media, Multimedia, Internet

Reference Books:

1. Computer Fundamental Architecture and Organization – B. Ram.
2. Computer Fundamentals – Sukhvir Singh (Khanna Publication)
3. “O” Level (Module – I) Information Technology – V.K. Jain
4. Introduction to IBM PC – Peter Norton
5. Microprocessor Architecture, Programming Applications – Ramesh S. Gaonakar
6. Illustrated MS-DOS 6.22 – Russell A. Stultz

Core Course 1 Lab: DOS

[Credits: 2, Lab: 30]

Directory Structure, File naming Convention and valid characters for filenames.

Internal Commands:CLS, DIR, COPY CON, TYPE, REN, COPY, DATE, TIME, DEL, MD, RD, CD, ERASE, PROMPT, ECHO, PATH, PAUSE, SET, VER, VOL, REM.(.) Current Directory, (..) Root Directory, External Commands:FORMAT, CHKDSK, SCANDISK, DISKCOPY, SORT, FIND, SHIFT, ATTRIB, XCOPY, TREE, UNDELETE, EDIT, DELTREE, MOVE, DEFRAG, MORE, IF EXIST, BREAK, VERIFY, Redirection, Pipes, Command Line Parameter. Executable Files, Text Files, Batch Files.

Course Outcome:

- Skill to build and troubleshoot digital logic circuits.
- Ability to interpret logic gates and its operations.
- Familiarization with semiconductor memories in electronics.
- Familiarization with computer architecture and networking.

Course Objective:

- To introduce students to a powerful programming language – C.
- To understand the basic structure of a C program.
- To gain knowledge of various programming errors.
- To enable the students to make flowchart and design an algorithm for a given problem.
- To enable the students to develop logics and programs.

CC-2: Programming Techniques Using C [Credits: 4, Lectures: 60]

Unit 1: Introduction to Programming (6 Lectures)

History of C, Overview of Procedural Programming, Introduction to Algorithm & Flowcharts.

Unit 2: Understanding Compilation and Execution in C (6 Lectures)

Using main() function, Compiling and Executing Simple Programs in C.

Unit 3: Data Types, Variables, Constants, Operators and Basic I/O (7 Lectures)

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar), Formatted and Console I/O (printf(), scanf()), Using Basic Header Files (stdio.h, conio.h).

Unit 4: Expressions, Conditional Statements and Iterative Statements (7 Lectures)

Simple Expressions in C (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

Unit 5: Understanding Functions (6 Lectures)

Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Unit 6: Implementation of Arrays and Strings (6 Lectures)

Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

Unit 7: User-defined Data Types (Structures and Unions) (4 Lectures)

Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

Unit 8: Pointers and References in C (8 Lectures)

Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

Unit 9: Memory Allocation in C (3 Lectures)

Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

Unit 10: File I/O (4 Lectures)

Opening and closing a file, Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files,

Unit 11: Preprocessor Directives (3 Lectures)

Understanding the Preprocessor Directives (#include, #define)

Reference Books:

1. ANSI C – E. Balagurusamy
2. Programming in C – Gottfried (TMH).
3. Let us C – YashwantKanetkar
4. "The C Programming Language ANSI C Version", Kernighan & Ritchie, Prentice Hall Software Series
5. "ANSI C - Made Easy", Herbert Schildt, Osborne McGraw-Hill
6. "Learning to Program in C", N. Kantaris, Babani
7. "C - The Complete Reference", Herbert Schildt, Osborne McGraw-Hill
8. "Programming in C", ReemaThareja, Oxford University Press
9. "A First Course in Programming With C", T. Jeyapoovan, Vikas Publishing House
10. "Let Us C", Yashavant P. Kanetkar, BPB Publications

Core Course 2- Lab

[Credit: 2, Lab: 30]

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. WAP to perform input/output of all basic data types.
2. WAP to enter two numbers and find their sum.
3. WAP to reverse a number.
4. WAP to Swap Two Numbers.
5. WAP to Check Whether a Number is Even or Odd
6. WAP to compute the factors of a given number.

7. WAP to enter marks of five subjects and calculate total, average and percentage.
8. WAP to print the sum and product of digits of an integer.
9. WAP to Check Whether a Character is Vowel or Consonant
10. WAP to Find the Largest Number Among Three Numbers
11. WAP to compute the sum of the first n terms of the following series $S = 1 - 2 + 3 - 4 + 5 - \dots$
12. WAP to compute the sum of the first n terms of the following series $S = 1 + 1/2 + 1/3 + 1/4 + \dots$
13. WAP to print a triangle of stars as follows (take number of lines from user):

```

      *           1           1           1   A           A
     ***        11         2 3         1 2   A B         BA
    *****     121       4 5 6       1 2 3   A B C       CBA
   *****      1331      7 8 9 10     1 2 3 4   A B C D
          DCBA
 *****      14641      11 12 13 14 15  1 2 3 4 5   A B C D E
EDCBA

```

14. WAP to perform following actions on an array entered by the user:
 - a) Print the even-valued elements
 - b) Print the odd-valued elements
 - c) Calculate and print the sum and average of the elements of array
 - d) Print the maximum and minimum element of array
 - e) Remove the duplicates from the array
 - f) Print the array in reverse order

The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.

15. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
16. Write a program that swaps two numbers using pointers.
17. Write a program in which a function is passed address of two variables and then alter its contents.
18. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
19. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
20. Write a menu driven program to perform following operations on strings:
21. Show address of each character in string
22. Concatenate two strings without using strcat function.
23. Concatenate two strings using strcat function.
24. Compare two strings
25. Calculate length of the string (use pointers)
26. Convert all lowercase characters to uppercase
27. Convert all uppercase characters to lowercase
28. Calculate number of vowels
29. Reverse the string
30. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
31. WAP to display Fibonacci series (i)using recursion, (ii) using iteration

32. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
33. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
34. Write a menu-driven program to perform following Matrix operations (2-D array implementation):
 - a) Sum
 - b) Difference
 - c) Product
 - d) Transpose
35. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
36. Write a program to retrieve the student information from file created in previous question and print it in following format:

Roll No.	Name	Marks
----------	------	-------
37. Copy the contents of one text file to another file, after removing all whitespaces.
38. WAP to Write a Sentence to a File.
39. WAP to Read a Line From a File and Display it.
40. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
41. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.

Course Outcome:

- In-depth understanding of various concepts of C language.
- Ability to read, understand and trace the execution of programs.
- Skill to debug a program.
- Skill to write program code in C to solve real world problems.

1st Year: Semester II

Course Objective:

- To learn the syntax and semantics to write Java programs.
- To understand the fundamentals of object-oriented programming in Java.
- To familiarize with the concept of inheritance, polymorphism, packages and interfaces.

Core Course -3: Programming in JAVA

[Credit: 4, Lecture Hours: 60]

Unit 1: Introduction to Java (4 Lectures)

Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods),

Unit 2: Arrays, Strings and I/O (8 Lectures)

Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit 3: Object-Oriented Programming Overview (4 Lectures)

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

Unit 4: Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata (14 lectures)

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

Unit 5: Exception Handling, Threading, Networking and Database Connectivity (15 Lectures)

Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

Unit 6: Applets and Event Handling (15 Lectures)

Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, textfields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Reference Books:

1. Ken Arnold, James Gosling, David Homes, "The Java Programming Language", 4th Edition, 2005.
2. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley "The Java Language Specification, Java SE 8 Edition (Java Series)", Published by Addison Wesley, 2014.
3. Joshua Bloch, "Effective Java" 2nd Edition, Publisher: Addison-Wesley, 2008.
4. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 1 ,9th Edition, Printice Hall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition, Printice Hall.2013
6. Bruce Eckel, "Thinking in Java", 3rd Edition, PHI, 2002.
7. E. Balaguruswamy, "Programming with Java", 4th Edition, McGraw Hill.2009.
8. Paul Deitel, Harvey Deitel, "Java: How to Program", 10th Edition, Prentice Hall, 2011.
9. Bert Bates, Kathy Sierra, "Head First Java", Orielly Media Inc. 2nd Edition, 2005.
10. Object Oriented Programming through JAVA, P Radha Krishna, University Press
11. David J. Eck, "Introduction to Programming Using Java", Published by CreateSpace Independent Publishing Platform, 2009.
12. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2nd Edition, 2004.
13. R. Nageswara, Core Java: An Integrated Approach, Dreamtech Press

Core Course 3 (Programming in JAVA) Lab[Credit: 2, Lab: 30]

Students are advised to do laboratory/practical practice not limited to, but including the following types of problems:

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .length in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard
7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8. Write a program that show working of different functions of String and StringBuffer classes like set CharAt(), set Length(), append(), insert(), concat() and equals().
9. Write a program to create a —distance class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
10. Modify the —distance class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to

- another object reference variable. Further create a third object which is a clone of the first object.
11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
 12. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
 13. Write a program to show the use of static functions and to pass variable length arguments in a function.
 14. Write a program to demonstrate the concept of boxing and unboxing.
 15. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
 16. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate fibonacci series is given in a different file belonging to the same package.
 17. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
 18. Write a program —DivideByZero that takes two numbers a and b as input, computes a/b, and invokesArithmetic Exception to generate a message when the denominator is zero.
 19. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
 20. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
 21. Write a program to demonstrate priorities among multiple threads.
 22. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
 23. Write a program to create URL object, create a URL Connection using the open Connection() method and then use it examine the different components of the URL and content.
 24. Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
 25. Write a program that creates a Banner and then creates a thread to scrolls the message in the banner from left to right across the applet,,s window.
 26. Write a program to get the URL/location of code (i.e. java code) and document(i.e. html file).
 27. Write a program to demonstrate different mouse handling events like :-mouse Clicked(),mouse Entered(), mouse Exited(), mouse Pressed, mouse Released() and mouse Dragged().
 28. Write a program to demonstrate different keyboard handling events.
 29. Write a program to generate a window without an applet window using main() function.
 30. Write a program to demonstrate the use of push buttons.

Course Outcome:

- Skill to write Java application programs using OOP principles and proper program structuring.
- Ability to create packages and interfaces.
- Ability to implement error handling techniques using exception handling.

Course Objective:

- To enable the students to understand the functionality and implementation of computer system.
- To familiarize with the various instruction codes and formats of different CPUs.
- To introduce the students to I/O and memory organization of computer system.
- To deliver an overview of Control Unit of a computer system.
- To learn the usage of parallel and vector processing.

Core Course-4: Computer System Architecture[Credits: 6 (5 + 1), Lectures: 60]

Unit 1: Basic Computer Organization and Design (13 lectures)

Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit 2: Central Processing Unit (15 lectures)

Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, pipelining and parallel processing.

Unit 3: Memory Organization (8 lectures)

Shift registers, Multiplexers, Encoder, Decoder, Half Adder, Full Adder, Cache memory, Associative memory, mapping.

Unit 4: Processors (14 lectures)

8086, 8088, 80286, 80386, 80486, P5, Dual Core, Core2Duo, Quadra core, Octa core, Real Mode & Protected Mode, addressing modes, instruction codes, Difference between DX & SX of different microprocessor,

Unit 5: Bus Architecture (10 lectures)

Bus width, Clock Pulse Generator, DMA controller, PIC (Programmed Interrupt Controller), memory, ports, Communications, Architecture – ISA, EISA (Brief Description)

Reference Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009
4. M.M. Mano , Digital Design, Pearson Education Asia, 2013
5. Carl Hamacher, Computer Organization, Fifth edition, McGrawHill, 2012.

Course Outcome:

- Ability to understand the functionality, organization and implementation of computer system.
- Skill to recognize the instruction codes and formats.
- Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.
- Familiarization with the working of parallel processing and vector processing.

2nd Year: Semester III

CC5: Python Programming

[Credit: 4, Lecture Hours: 60]

Course Objective:

This course covers the basics and advanced Python programming to harness its potential for modern computing requirements.

Unit 1: Introduction and overview

(10 Lectures)

Introduction, What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range() Built-in Function, Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples

Unit 2: Python Objects

(10 Lectures)

Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Categorizing the Standard Types, Unsupported Types. Numbers and Strings. Built-in Functions, String Built-in Methods, Special Features of Strings

Unit 3: Lists

(10 Lectures)

Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples

Dictionaries

Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, **Conditionals and Loops:** if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement

Unit 4: Files and Input/Output

(10 Lectures)

File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules

Unit 5: Advance topics

(10 Lectures)

Security – Encryption and Decryption , Classical Cyphers

Graphics and GUI Programming – Drawing using Turtle, Tkinter and Python, Other GUIs

Unit 6: Errors and Exceptions

(10 Lectures)

What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions

Functions: Functions, Calling Functions, Creating Functions, Formal Arguments, Positional Arguments, Default Arguments, Why Default Arguments?, Default Function Object Argument Example, Variable- length Arguments, Non-keyword Variable Arguments (Tuple), Keyword Variable Arguments (Dictionary)

[Credits: 2, Lab: 30]

Software Lab Based on Python: Students are advised to do laboratory/practical practice.

Reference Books:

1. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India
2. R. Nageswara Rao, “Core Python Programming”, dreamtech
3. Wesley J. Chun. “Core Python Programming - Second Edition”, Prentice Hall
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Python”, Wiley
5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication
6. Luke Sneeringer, “Professional Python”, Wrox
7. “Hacking Secret Ciphers with Python”, Al Sweigart, URL-
<https://inventwithpython.com/hacking/chapters>

Course Outcome:

After learning the course, the student will be able:

1. To develop proficiency in creating based applications using the Python Programming Language.
2. To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
3. To be able to do testing and debugging of code written in Python.
4. To be able to draw various kinds of plots using PyLab.
5. To be able to do text filtering with regular expressions in Python
6. To be able to create socket applications in Python
7. To be able to create GUI applications in Python

CC -6: Operating Systems

[Credit: 4, Lecture Hours: 60]

Course Objective:

To study the basic concepts and functions of operating systems and learn the basics Unix Commands

Unit 1: Introduction

(06Lectures)

Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations, process control & real time systems. Multiuser, multitasking, multiprocessing and real time operating systems,

Unit 2: Operating System Organization

(6 Lectures)

Processor and user modes, kernels, system calls and system programs, Various components of operating system with reference to DOS. BIOS, BIOS and DOS interrupt, Single user operating system. Task loader, Memory management.

Unit 3: Process Management

(10 Lectures)

System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-preemptive and preemptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks. Device management. Control of various devices. Device drivers. Interrupt driven and poll driven data transfers. Need of software and hardware protocols.

Unit 4: Memory Management

(08 Lectures)

Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory

Unit 5: File and I/O Management

(08 Lectures)

Directory structure, file operations, file allocation methods, device management, File systems. File management. Process management and scheduling Special requirements and facilities for multiprocessing environment

Unit 6: Protection and Security

(4 Lectures)

Policy mechanism, Authentication, Internal access Authorization.

Unit 7: Introduction to Unix

(08 Lectures)

Brief history of UNIX, Features of UNIX, Structure of the UNIX system, functions of shell & kernel.

UNIX File System (etc,bin,dev,usr,lib,tmp).

Types of files (ordinary, special & directory files),

Pathname - absolute & relative, block and character device,

Internal structure of File System (boot block, super block,

inode block, data block).

Files opened by UNIX - stdin(0), stdout(1), stderr(2)

Shell variables - HOME, PATH, TERM, LOGNAME, PS1, PS2, MAIL.

Unit 8: Unix Commands

(10 Lectures)

ls [options- A,d,F,i,l,r,R,t,u,x] [files..] wild card characters *, ?, [a..z], cat , rm [options -i,r][files..], cal, date [m,h,a,D,x,V], banner, passwd, pwd, echo, who[options- H,u], who am i, logname, clear, tty, tput clear, mkdir, cd, rmdir, comm, diff, cmp, chmod, chgrp, chown, Redirection & pipes { <, >, >>, | } cp [options -i,r][files..], tee, ln, mv, wc [options-l,w,c] [files..], grep[options-c,i,l,n,v], pr [(+n)d(on)(1n)] [files....], passwd, pg, more, sleep, write, mesg, wall, lp [cm(n number)], ps [options- a, e, u], kill [-9] <pid>. Vi modes of vi - command mode & edit mode. vi +n file, vi /pattern file exiting - ZZ, :wq, :q!, :qi, :x , window movement- ^d, ^u, ^f, ^b, z, z., z-, text entry - a, i, o, A, O, I, cursor movement - l , k,j, h,^, \$,[n]w, [n]b, [n]e,), (,return,H, M, L deletion of text-[n]x, [n]X,[n]r,R, [n]s,d\$,d^ undo- u & U, redraw screen-^, pattern searching -/pattern, ?pattern rearranging textJ, P, p operators- [n]dd, [n]yy, cc, vi options - :set,:set allnu, showmode last line commands contd ... :w!, :w <name>, :w! <name>, :w, :r <name>

PROGRAMMING THE BOURNE SHELL

echo, \c, \t, \n, \v, \\\

executing a shell script

test <expression>

```

files      :r, w,x,f,d,e,s
string     :z,n,s1=s2,s1!=s2
numerics  :- n1 [opt] n2
           opt - gt, lt, eq, ne, ge, le
read <variable>, if ... then..elif..else ... fi,
case ... esac, while, until, for.

```

Operating Systems Lab[Credit: 2, Lab : 30]

Students are advised to do laboratory/practical practice.

Course Outcome:

After learning the course the students should be able to:

Understand various generations of Operating System and functions of Operating System
Write shell scripts in Linux/UNIX environment.

Reference books :

1. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
2. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
3. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
4. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.
5. Operating Systems, A K Sharma, University Press
6. Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
7. Operating System Concepts (4th Ed.) by Abraham Silberschatz & Peter B. Galvin
8. A User Guide to UNIX System by Dr. Rebecca Thomas and Jean Yates
9. Concepts & Application by Sumitabha Das
10. Peter Norton's guide to Unix

CC-7: Structured System Analysis and Design [Credit: 6(5+1), Lecture Hours: 60]

Unit 1. Concept of System

(10 Lectures)

Characteristics of system (Organisation, Interaction, Interdependence, Integration, Central objectives), Types of system -Physical & abstract system, open & closed system, Man made information system, Computer based information system.

Unit 2. System Life Cycle

(10 Lectures)

Different stages of the system life cycle and the forms generated at each level -Conception, initiation, analysis, design, construction (project request form, system proposal, functional specifications, information requirement table) role of the systems analyst.

Unit3.Context Analysis Diagram

(10 Lectures)

Introduction to Context analysis diagram, Data flow diagram, External entity, data flow, data store, process

Unit 4. Normalization

(05 Lectures)

Normalization first level, second level and third level normalization

Unit 5. Introduction to Data dictionary**(05 Lectures)**

Data dictionary and its organization, Data structure, data element, data flows, data stores & process (decision tree, decision table, structured english)

Unit 6. DFD**(10 Lectures)**

Levelled data flow diagrams, Balancing of levelled DFD's, local data stores, current physical DFD, current logical DFD, proposed logical DFD, proposed physical DFD, automation boundary

Unit 7. Systems Design**(10 Lectures)**

Systems Design Translations of functional specifications into design specifications i.e., from logical design to physical design

Reference Books:

1. Analysis and Design Of Information System. - V. Rajaraman

2nd Year: Semester IV**CC-8: Computer Networks****[Credit: 6(5+1), Lecture Hours: 60]****Unit 1: Introduction to Computer Networks****(8 Lectures)**

Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Unit 2: Data Communication Fundamentals and Techniques**(10 Lectures)**

Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

Unit 3: Networks Switching Techniques and Access mechanisms**(10 Lectures)**

Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit 4: Data Link Layer Functions and Protocol**(10 Lectures)**

Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols-stop and wait ARQ, go-back-n ARQ; Point to Point Protocol on Internet.

Unit 5: Multiple Access Protocol and Networks**(5 Lectures)**

CSMA/CD protocols; Ethernet LANs; connecting LAN and back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

Unit 6: Networks Layer Functions and Protocols**(6 Lectures)**

Routing; routing algorithms; network layer protocol of Internet- IP protocol, Internet control protocols

Unit 7: Transport Layer Functions and Protocols**(6 Lectures)**

Transport services- error and flow control, Connection establishment and release- three way handshaking

Unit 8: Overview of Application layer protocol**(5 Lectures)**

Overview of DNS protocol; overview of WWW & HTTP protocol

Suggested Readings

1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM, 2007.
2. A. S. Tanenbaum: Computer Networks, Fourth edition, PHI , 2002
3. Dr. Rakesh Kumar Mandal: Computer Networks for Students, First Edition, SPD, 2018

CC -9 : VB.NET

[Credit: 4, Lecture Hours: 60]

Unit 1 : Introduction – .NET Framework Technology, Advantage, Framework Class Library : data types, exceptions, events, attributes, collections, remote calls, threading, web services etc., Working with .NET FCL : namespaces. **(04 Lectures)**

Unit 2 : Language – Data Types, Operators, Modifiers, Directives, Programming Constructs : decision making, case and iteration, Arrays, Procedures & Functions, Library Functions : string, date & time, math, number and Miscellaneous. **(04 Lectures)**

Unit 3 : OOPS – Features, Declaring classes, Properties, Public & Private variables, Inheritance, Overloading, Overriding, Virtual Methods and Abstract Class. **(05 Lectures)**

Unit 4 : Windows Form – Introduction to Class Libraries, Event and Event Handlers, Winforms and GUI, Creating Applications using Winforms, Concept of Controls, Different GUI Controls, their properties, methods and event procedures and Programs using controls. **(15 Lectures)**

Unit 5 : Error Handling in Windows Form – Introduction to Errors, Exceptions & Validations, Types of Validations, Types of Errors, Types of Exceptions. **(07 Lectures)**

Unit 6 : SDI & MDI Applications – Introduction, Characteristics & Drawbacks, File Handling program. **(03 Lectures)**

Unit 7 : Data Access – Introduction to Microsoft Data Access Technologies, ADO.NET : overview, architecture, class libraries, Creating Database, Connecting to Database, Databound Controls, Creating Data Set, Manipulating Records and XML Data. **(15 Lectures)**

Unit 8 : Component Object Module (COM) – Fundamentals of Custom Control, Introduction to COM, Events and User Controls, Web Programming. **(07 Lectures)**

Core Course 9 - Lab

[Credit: 2, Lab : 30]

Students are advised to do laboratory/practical practice.

Reference Books:

1. Programming in VB .Net: V. Karthika: Books

CC -10 : RDBMS and Oracle

[Credit: 4, Lecture Hours: 60]

Unit 1: Introduction

ORACLE, Relational Approach, Various aspect of relational model

(04 Lectures)

Unit 2: Introduction to SQL

(10 Lectures)

Feature of SQL, Query with SQL, Arithmetic expression, Column aliases, Concatenated columns, Literals Writing SQL statements, Clauses, Select, order by, where, group by, distinct, having, SQL operators, Between... and..., In(list), Like, Is null, Not between, Not in, Not like, Is not null, SQL commands, Del, list, get, save, run, start, edit, exit, clear buffer, etc, Running standard queries with substitution variables, Single ampersand substitution variable, double ampersand substitution variable, define, underline, accept, prompt, no prompt, hide

Unit 3: Functions

(10 Lectures)

Date function: ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN, NEXT_DAY, GREATEST, LEAST etc. Formats :MM, DD, MON, MONTH, D, DAY, YYYY, YY, YY, YEAR, WW, W, HH, A.M.,P.M., FM, TH, SP, SPTH, THSP, etc.

String function: RPAD, LPAD, LOWER, UPPER, INITCAP, LENGTH, SUBSTR, INSTR, TRANSLATE, REPLACE

Arithmetic function: ABS, ROUND, COS, LOG, EXP, SQRT, SIGN, SIN, MOD, POWER, FLOOR etc.

Conversion function: TO_CHAR, TO_DATE, TO_NUMBER etc.

Miscellaneous function: DECODE, NVL etc

Group column function: AVG, COUNT, MAX, MIN, SUM etc.

Nested function : Sub queries, nested sub queries

Join: Equi join, outer join, inner join, non-equi join

Set operator: Union, intersect, minus

Unit4: Building a report in SQL*PLUS

(10 Lectures)

Commands: Column, rem, heading. Null, skip, ttitle, btitle, etc., Breaking a report in sections, Break on, compute, Set commands, spooling, show commands, environments variables, Creating defining table structures (DDL), Introduction to data definition language, Creating a table, Integrity constraints, Creating tables using hierarchical relation, Creating tables with rows from another table, Alter table & drop table, Data dictionary, Create views, Create sequences, Create index, Data manipulation language(DML), Commands to manipulate data, Data control language (DCL), DCL Commands

Unit 5: PL/SQL

(10 Lectures)

Introduction, PL/SQL structure, The environment of PL/SQL, Features of PL/SQL, The rules of block structure (Declare , Begin , ... End), Nested block, Declaring Constants and variables, PL/SQL variables and Bind variables, Procedures, Functions, SQL Commands in PL/SQL, Exception handling, Predefined, User Defined, Control structure, If statement, GOTO, For..Loop, while, exit, Records in PL/SQL, %ROWTYPE, Implicit & Explicit cursors, cursor, fetch, declare, open, close etc., Database Triggers, Creating Triggers, Before and After Trigger, Row level Trigger, Statement level Trigger

Unit 6: ORACLE FORMS:

(10 Lectures)

Introduction, Oracle form designer, Object navigator, Canvas view, Property Sheet, PL/SQL editor, Blocks, LOVs, Radio Buttons, Alerts, Form Triggers, Form Level Triggers, Block level triggers, Item level triggers, Query triggers, Navigation triggers, Writing PL/SQL code, Master Detail relationship

Unit7: ORACLE REPORT DESIGNER

(06 Lectures)

Creation of reports, Ordinary reports & matrix reports

Core Course 10- Lab

[Credit: 2, Lab: 30]

Development of a business application in RDBMS

3rd Year: Semester V

CC -11 : Data Structures

[Credit: 4, Lecture Hours: 60]

Unit 1: Introduction to data structures

Unit 2 : Linear data structures

Arrays: Definition, concept and operation on arrays

Linked list :Singly linked list, Circularly linked list, Doubly linked list

Stacks: Creation, Push , Pop

Queues: creation, insertion and deletion

Unit 3: Non-linear data structures

Tree: Definition, concept and operation of trees, Storage representation of binary trees, Manipulation of binary trees, B_tree, AVL trees, Tree Traversal Algorithms

Unit4: Sorting

Selection sort, Bubble sort, Merge sort, Quick sort, Heap sort,

Unit 5: Searching

Sequential searching, Binary searching

Reference books:

1. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning, 2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition, Universities Press, 2011.
3. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using C and C++:", Second edition, PHI, 2009.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson, 1999.
5. D.S Malik, Data Structure using C++,Second edition, Cengage Learning, 2010
6. Mark Allen Weiss, "Data Structures and Algorithms Analysis in Java", Pearson Education, 3rd edition, 2011.
7. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures Using Java, 2003.
8. Robert Lafore, "Data Structures and Algorithms in Java, 2/E", Pearson/ Macmillan Computer Pub,2003.
9. John Hubbard, "Data Structures with JAVA", McGraw Hill Education (India) Private Limited; 2 edition, 2009.

10. Goodrich, M. and Tamassia, R. "Data Structures and Algorithms Analysis in Java", 4th Edition, Wiley, 2013
11. Herbert Schildt, "Java The Complete Reference (English) 9th Edition Paperback", Tata McGraw Hill, 2014.
12. D. S. Malik, P.S. Nair, "Data Structures Using Java", Course Technology, 2003.

Core Course 11- Lab

[Credit: 2, Lab Hours: 60]

Students are advised to do laboratory/practical practice.

CC-12: Introduction to Big Data Analytics [Credit: 6(5+1), Lecture Hours: 60]

Unit 1 : Overview – Introduction, Data Mining Life Cycle : CRISP-DM Methodology and SEMMA Methodology. Big Data Life Cycle **(04 Lectures)**

Unit 2 : Methodology – Difference from traditional statistical approach of experimental design, Statistical Modelling. **(03 Lectures)**

Unit 3 : Deliverables & Stakeholders in BDA – Machine Learning Implementation, Recommender System, Dashboard, Ad-Hoc Analysis, Project/Project Understanding, Establishing advantages of the analysis. **(15 Lectures)**

Unit 4 : Data Analyst & Data Scientist – Introduction, Work-area and Role. **(01 Lecture)**

Unit 5 : BDA Methods – Introduction to R, Introduction to SQL, Charts and Graphs, Data Tools, Statistical Methods. **(07 Lectures)**

Unit 6 : BDA Project Management – Project Description, Problem Definition : Supervised Classification, Supervised Regression, Unsupervised Learning & Ranking, Data Collection (mini project-twitter), Data Mining / Cleansing : homogenization & heterogenization, Summarizing, Data Exploration : exploratory data analysis and Data Visualization : generation of correlation matrix visualization. **(30 Lectures)**

3rd Year: Semester VI

CC13: Web Technologies

[Credit: 4, Lecture Hours: 60]

Unit 1 : Web Basics – Introduction & Concept of Internet, History of Internet, Advantage and Disadvantage of Internet, Protocols Used, WWW, Domain : Letter Addressing System (URL), Domain : Number Addressing System (IP Address), Dedicated Access, Dial-up Access, Purchasing/Renting Domains (web sites), Web Server, Browsers, Introduction to Cyber Law, Introduction to e-Commerce. **(04 Lectures)**

Unit 2 : HTML – Introduction and History, Basic structure of HTML document, Head Elements : Title, Meta, Style, Base & Link. Body Element properties : Background, BgColor, Text, Link, Vlink, Alink, BgProperties & Margin. Font Element properties : Size, Color & Face. Other text basics - Heading, Line Break, Paragraph, Span, HR, Center. Marquee Element properties : Align, Behaviour, BgColor, Direction, Height, Width, Loop, ScrollAmount, ScrollDelay, HSpace, VSpace. Anchor Element properties : Href, Rel, Name, Title & Targets. List Elements and their properties : LI, OL, UL, Menu & DIR. Table elements – Table, TH, TR & TD and their properties – Rowspan, Colspan, Caption, Border, Width, Align, VAlign, BgColor, BorderColor, & CellSpacing. Form Elements – Input, Select & Option and their properties – Type, Value, Name, ID, Size, Checked, MaxLength, Align, SRC, Multiple & Selected. Form properties : Methods – Get & Post and Action. HTML Media. **(15 Lectures)**

Unit 3 : Cascading Style Sheet (CSS3) – Introduction, Units, Types, Basic properties : text, font, color, background, image, link, table, border, margin, list, padding, cursor, scrollbar, dimension, visibility, positioning, layers, text effects, layouts, multi background, shadow, multi columns, gradient, user interface, responsive css, animation etc. **(05 Lectures)**

Unit 4 : Dynamic HTML and XML – Introduction, Difference b/w HTML and DHTML, Advantages of DHTML, CSS for DHTML, Document Object Models (DOMs), Event Handling, Data Binding, Introduction to XML. **(05 Lectures)**

Unit 5 : PHP (with ref to HTML) – Introduction, Program Structure, Data Types, Variables and Constants, Operators, Programming Constructs : Decision, Iteration and Case. Strings, Arrays, Accessing HTML data using Get and Post, User Defined Functions and their usage, Library Functions : String, Date & Time, Number, Math and Miscellaneous. Global Constants and Macros. Sessions, Cookies, File Handling, Data Uploading, Sending Emails and SMSs, Error Handling, OOPS. **(20 Lectures)**

Unit 6 : MySQL (with ref. To PHP) – Introduction, Database operations : creation, selection and dropping and connecting from web-page using PHP. Data Types. Table operations : creating, altering, dropping, inserting/updating/deleting/querying of records, all using PHPMyAdmin and PHP code. **(04 Lectures)**

Unit 7 : Java Script and AJAX (with ref. To PHP and HTML) – JS Introduction, Program Structure, Data Types, Variables and Constants, Operators, Programming Constructs : Decision, Iteration and Case. Strings and Arrays. User Defined Functions and their usage. Event Handling, Error Handling, Validation and Animation. **AJAX** introduction, XMLHttpRequest, Database operations. **(07 Lectures)**

Core Course 13- Lab

[Credit: 2, Lab: 30]

Software Lab Based on Web Technologies: Students are advised to do laboratory/practical practice.

CC-14 : Android and App Development

[4 Credits, 60 Lectures]

Unit 1: Refreshing Java:

(01 Lectures)

Java introduction, OOPs Concepts, Abstract class & Interface, Exception handling, Multi threading(Thread class & Runnable Interface)

Unit 2: Android:

(08 Lectures)

Introduction to Android, Why Android?, Android Run Time, Android Studio, Introduction to Gradle, Fundamentals : Basic Building blocks – Activities, Services, Broadcast Receivers & Content providers, UI Components- Views & notifications, Components for communication -Intents & Intent Filters, Android API levels(versions & version names)

Unit 3: Application Structure:

(09 Lectures)

AndroidManifest.xml, uses-permission, Activity/services/receiver declarations, Resources & R.java, Layouts & Drawable Resources, Activities and Activity lifecycle

Unit 4: Emulator:

(08 Lectures)

Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to Android Device Monitor (ADM), File explorer, Intents: Explicit Intents, Implicit intents

Unit 5: Basic UI design, Styles & Themes :

(08 Lectures)

Form widgets, Text Fields, Layouts - RelativeLayout , TableLayout, FrameLayout, LinearLayout, Nested layouts, [dip,dp,sip,sp] versus px, styles.xml, drawable resources for shapes, gradients(selectors), Style attribute in layout file, Applying themes via code and manifest file, AlertDialogs & Toast, Time and Date, Images and media

Unit 6: Menu:

(08 Lectures)

Option menu And Action Bar (menu in action bar), Context menu and contextual action mode, Popup menu, menu from xml, menu via code, Linkify, MatchFilter & TransformFilter, Adapters : ArrayAdapter, BaseAdapters, ListView and ListActivity, Custom listview, GridView using adapters, Gallery using adapters, Android Session and Session management

Unit 7: Content Providers:

(10 Lectures)

SQL, DML & DDL Queries in brief, SQLiteDatabase, SQLiteOpenHelper, Cursor, SQLite Programming, Reading and updating Contacts, Android Debug Bridge(adb) tool, Broadcast Receivers, Services

Unit 8: Notifications:

(08 Lectures)

Alarm, Via service, Customize: Toast, Dialogs, Tabs, Animated popup panels, Grid view, Spinner, Thread. AsyncTask, XML Parsing, Android JSON parsing using Volley, How to create REST API for Android app using PHP, Mysql, Accessing Phone services(Call,SMS)

Core Course 14- Lab

[Credit: 2, Lab: 30]

Software Lab Based on Android: Students are advised to do laboratory/practical practice.

Semester – I
Paper– AECC I
English Composition

Unit – I
Prose/Short Stories

1. R. K. Narayan – An Astrologer’s Day
2. Mulk Raj Anand – The Lost Child
3. Guy de Maupassant – The Diamond Necklace
4. Leo Tolstoy – Three Questions
5. O. Henry – The Gift of The Magi

Unit – II
Poetry

1. Rabindranath Tagore – where the Mind is Without Fear
2. Sarojini Naidu - The Soul’s Prayer
3. Toru Dutt – The Louts
4. John Donne – Death Be Not Proud

Unit – III
(a) Grammar

Articles, Preposition, Subject – Verb Agreement, Model Auxiliaries, Common Errors, Clauses and Sentences

(b) Vocabulary

Synonyms, Antonyms, One Words Substitution, Idiomatic uses of Verbs & Phrases

Unit – IV
Written Communication

Letter writing, Application writing, Job Application with covering letter and C. V., Paragraph writing, Precis writing, Report writing, Agenda, Minutes, Memorandum

Unit – V
Spoken Communication

Speech, Dialogue, Group Discussion, Interview, Exchanging greeting and taking leave, Answering the telephone, taking and leaving message, Calling for medical support in an emergency, Stress and Accent in speech

MODE OF EXAMINATION
Internal Assessment for Test : 30 Marks

Marks Distribution for internal Test :

(i)	Mid- Term Examination:	10 Marks	2 X 7.5 = 15
(ii)	Quiz/ Assignment	05 Marks	
(iii)	Presentation	05 Marks	
(iv)	Regular, Punctuality & Attendance & Conduct	10 Marks	
	Total :	<hr/>	30 Marks

SEMESTER AND UNIVERSITY EXAMINATION : 70 Marks

The Paper will be divided into five Units. One question should be answered from each unit.

5 X 14 marks = 70 marks

(Two questions should be set from each unit)

Suggested Readings :

1. Prism : Spoken and Written Communication, Prose & Poetry – Orient Longman
2. A Course in English Grammar – Bakshi, R. N. Orient Longman
3. Reference Grammar for Students of English – Close, R. A. Orient Longman
4. Modern English – A Book of Grammar, Usage & Composition – Krishnaswamy, N., Macmillan India Ltd.
5. How to communicate effectively in Business – Kenneth Roman
6. HBR Guide to Better Business Letter – Bryan A. Garner
7. Fluency in English – Part II, Oxford University, Press, 2006.
8. Spoken English : A Manual of Speech and Phonetics. Orient Black Swan. Bansal and Marison

AEC-2: Environmental Science
Lectures: 50]

[Credits: 4,

Unit 1: Introduction to environmental studies (2 lectures)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2: Ecosystems (6 Lectures)

- i. What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, foodwebs and ecological succession. Case studies of the following ecosystems :
 - a) Forest ecosystem
 - b) Grassland ecosystem
 - c) Desert ecosystem
 - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- ii. Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

- iii. Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).
- iv. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4: Biodiversity and Conservation (8 Lectures)

- i. Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots.
- ii. India as a mega--biodiversity nation; Endangered and endemic species of India.
- iii. Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In--situ and Ex--situ conservation of biodiversity.
- iv. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution (8 Lectures)

- i. Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- ii. Nuclear hazards and human health risks
- iii. Solid waste management: Control measures of urban and industrial waste.
- iv. Pollution case studies.

Unit 6: Environmental Policies & Practices (7 Lectures)

- i. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- ii. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 7: Human Communities and the Environment (6 Lectures)

- i. Human population growth: Impacts on environment, human health and welfare.
- ii. Resettlement and rehabilitation of project affected persons; case studies.
- iii. Disaster management: floods, earthquake, cyclones and landslides.
- iv. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- v. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- vi. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8: Field work (Equivalent to 5 Lectures)

- i. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- ii. Visit to a local polluted site--Urban/Rural/Industrial/Agricultural.
- iii. Study of common plants, insects, birds and basic principles of identification.
- iv. Study of simple ecosystems--pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.

2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36--37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29--64). Zed Books.
8. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
14. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

PAPER CODE : MATH I

Unit 1: Set theory (10 Lectures)

General form of De Morgan Laws: Cartesian product of sets; Equivalence relation induced by a partition of a set and fundamental theorem on equivalence relation; Composition and factorization of mapping, set mapping.

Unit 2: Abstract Algebra (12 Lectures)

Binary operations, Definition of group, Abelian group with examples, Uniqueness of identity element in a group. Cancellation laws in group, Definition of subgroup and cyclic group with examples; Definition of ring, integral domain and field with examples;

Unit 3: Matrices (8 Lectures)

Definition of matrix, operations of matrix algebra, kinds of matrices, transpose of determinants, solution of consistent system of linear equations.

Unit 4: Differential Calculus (20 Lectures)

Successive differentiation and Leibnitz's theorem. Taylor's series and Maclaurin's series. Partial differentiation: Euler's theorem, Indeterminate forms. Equation of Tangents and normal.

Unit 5: Number Theory (10 Lectures)

Division algorithm, Euclidean algorithm and GCD or HCF, Diophantine equations, Prime and Composite numbers, Definition of congruence modulo m and its properties, solution of linear congruence, Chinese Remainder Theorem

Reference Books:

GENERIC ELECTIVE COURSE: MATHEMATICS

[Credit: 6, Lecture Hours: 60]

PAPER CODE : MATH II

Unit 1: INTEGRAL CALCULUS (12 Lectures)

Integration of rational and irrational functions, Integration as a summation. Reduction formulae. Rectification and Quadro true with simple examples. Volume and Surface- area of solids of revolution. Moment of Inertia

Unit 2: DIFFERENTIAL EQUATIONS -I (12 Lectures)

Differential Equations of the first order and first degree: Variable separable, reducible into variable separable, Homogeneous equations, Linear Differential Equations, reducible into linear differential equations;

Unit 3: DIFFERENTIAL EQUATIONS -II (12 Lectures)

Differential Equations of the first order but not of first degree and Clairaut's form, Orthogonal trajectories, Differential Equations of higher order with constant coefficients with physical examples

Unit 4: Cryptography (12 Lectures)

Data encryption techniques: Algorithm, Block and stream ciphers, Private key encryptions- DES, AES, RC4, Algorithm for public key encryptions-RSA, Message authentication and hash function

Unit 5: LINEAR PROGRAMMING (12 Lectures)

Line segment, Hyperplane, Convex set, convex combination. Elementary properties of convex sets, Linear programming problems (LPP)- its formulation and solutions by Graphical and Simplex method

Reference Books:

PAPER NAME : STATISTICS

PAPER CODE : STAT I

The paper will contain three groups. The examinees will be required to answer in all 5 Questions, selection at least one question form each group. The number of questions to be set is indicated against each group.

Group A : General Statistics (four questions)

Definition and scope of Statistics, Frequency distribution, various measures of location and dispersion, Moments, Measure of skewness and Kurtosis. Scatter diagram, Bivariate table, Regression and method of least squares, correlation coefficient, standard error of estimate, Partial and Multiple correction and regression coefficients (for three variables only).

Group B : Probability and Probability Distributions (three questions)

Concept of sample space, Events, etc. Definition of probability, calculation of probability by enumeration, Total and compound theorems of probability. Concept of conditional probability, Bayes theorem, random variable, distribution function, Mathematical expectation, moment Generation function, Geometric, Binomial, Poisson distribution, rectangular and normal distributions with their properties.

Group C : Calculus of finite Differences (three questions)

Introduction to difference operators. Interpolation with equal as well as unequal intervals. Newton's and Lagrange's formulas with their proofs, Central difference formulae; Gauss's forward and backward formulae stirrings formula. Numerical integration: Trapezoidal rule; Simpson's one-third rule and three-eight rule.

Paper I (Practical) – 25 Marks

Practical Examination problem will be of three hours duration and based on paper-I (theory). The distribution of marks is as follow

Performance in practical examination	20
Practical Note book	05

Book Recommended :

1. Fundamental of Statistics Vol 1-Goon, Gupta, and Das Gupta
2. Finite Difference – H. C. Saxena

PAPER NAME : STATISTICS

PAPER CODE : STAT II

Paper – II (theory) 75 Marks

The paper will contain two groups. The examinees will be required to answer 5 questions selecting at least two from each group.

Students offering subsidiary course in Statistics must have Mathematics and or Statistics at the Intermediate level.

The examination in each theory paper will be of three hours duration.

Group-A

SAMPLING DISTRIBUTIONS AND TESTS OF SIGNIFICANCE

(Five Questions)

Concept of Sampling Distributions, Gamma and Beta distribution, distribution. Distribution of sample mean and variance, t and F distributions.

Standard errors of proportions and sample mean and their uses in large sample tests. Ideas of simple and composite hypothesis. Two types of errors, critical region, Small sample tests of significance concerning a single mean and single variance, difference of two means, Equality of two variances and correlation coefficient including Fishers z-transformation.

Problems of Estimation, Requisites of a good estimator, Maximum likelihood estimates. Confidence interval of mean of a normal population.

Group-A

DESIGN OF EXPERIMENT AND SAMPLE SURVEY

(Five Questions)

Principle of experimentation. Meaning and purpose of randomization, replication and local control. Methods of Analysis of Variance (ANOVA) in case of one- way and two- way classification. Layout and analysis of completely randomized design. Randomized Block Design and Latin Square Design 2^3 factorial experiment (excluding confounding).

Advantage of Sampling over Complete Enumeration, Planning and organization of sample surveys. Sources of errors in sampling, Simple random sampling, Stratified random sampling.

PRACTICAL

Paper- II (Practical) 25 Marks

Practical problems will be of three hours duration and based on Paper II (Theory). The distribution of 25 marks is as follows :

Practical Examination	20
Practical Notebook	05

CC 1 -BIOCHEMISTRY AND METABOLISM

UNIT I: Introduction to Biochemistry:

(10 Periods)

A historical prospective.

Amino Acids & proteins: Structure & functions. Structure and properties of Amino acids, Types of proteins and their classifications, forces stabilizing protein structure and shape. Different level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo and hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall Polysaccharides, Glycoproteins and their Biological Functions.

UNIT II:(10 Periods)

Lipids: Structure and Functions – Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, Cerebrosides, gangliosides, prostaglandins, Cholesterol.

UNIT III

(15 Periods)

Nucleic Acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides and Nucleotides, Purines and Pyrimidines. Biologically important Nucleotides, double helical model of DNA structure and forces responsible for A, B & Z -DNA, denaturation and renaturation of DNA.

UNIT IV

(15 Periods)

Enzymes: nomenclature and classification of enzymes, Holoenzyme, apoenzyme, cofactors, coenzymes, prosthetic groups, metalloenzymes, monomeric and oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active site, enzyme

specificity: types and theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria. Role of NAD⁺, NADP⁺, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic acid, Biotin Vitamin B12, Tetrahydrofolate and metallic ions

UNIT V

(20 Periods)

Carbohydrate metabolism: reaction, energetics, and regulation. Glycolysis: Fate of pyruvate under aerobic and anerobic conditions. Pentose phosphate pathway and its significances. Gluconeogenesis, Glycogenolysis and Glycogen synthesis. TCA cycle, Electron transport chain, Oxidative phosphorylation. β -oxidation of fatty acids.

UNIT VI

PRACTICALS

1. To study activity of any enzyme under optimum conditions.
2. To study the effect of pH, Temperature on the activity of salivary amylase enzyme.
3. Determinations of -pH optima, temperature optima, Km value, Vmax value, effect of inhibitor (inorganic phosphate) on the enzyme activity.
4. Estimation of blood glucose by glucose oxidase method.
5. Principles of colorimetry: (i) Verifications of beer's law, estimation of protein. (ii) To study relation between absorbance and % transmission.
6. preparation of buffers.
7. Separation of Amino acid by paper chromatography.
8. Qualitative tests for carbohydrates, Lipids, and proteins.

Suggested Reading.

1. Berg. J. M, Tymoczko, J.L and stryer. I (2006) Biochemistry -VI Edition W.H Freeman and co
2. Bachaman , B Gredssem, W and Jones R (2000) Biochemistry and Molecular Biology of Plants, American society of plant Biologists.

3. Nelson, D.L, Cox, M.M(2004) Lehninger Principles of Biochemistry, 4th Edition, WH freeman and Company, New York, USA.
4. Hopkins W.G and Huner, P.A (2008) Introduction to plant physiology, John Wiley and Sons.
5. Salisbury, F.B. and Ross. C.W (1991) Plant physiology, Wadsworth Publishing Co. Ltd.

CC 2 – CELL BIOLOGY

UNIT I (10 Periods)

Cell: Introduction and classification of organisms by cell structure, Cytosol, Compartmentalization of eukaryotic cells, cell fraction. Cell Membrane and Permeability: Chemical components of Biological Membranes, Organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT II (15 Periods)

Membrane vascular system, Cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate Filaments. Endoplasmic reticulum: Structure function including role in protein segregation. Golgi Complex: Structure, Biogenesis and function including role in protein secretion.

UNIT III (20 Periods)

Lysosomes: Vacuoles and micro bodies: Structure and functions. Ribosomes: structure and function including role in protein synthesis. Mitochondria: structure and function, Genomes, biogenesis. Chloroplasts: structure and function, genomes, biogenesis. Nucleus: structure and function, Chromosomes and their structure.

UNIT IV(10 Periods)

Extracellular Matrix: Composition, Molecules that mediate cell adhesion, membrane receptors for extra cellular Matrix, macromolecules, regulation of receptor expression and function. Signal transduction.

UNIT V(10 Periods)

Cancer: Carcinogenesis, Agents promoting Carcinogenesis, Characteristics and molecular basis of cancer.

UNIT VI

PRACTICALS

1. Study the effect of temperature and organic solvents on semi permeable membrane.
2. Demonstration of Dialysis.
3. Study of Plasmolysis and De-Plasmolysis.
4. Cell fractionation and determination of enzyme activity in organelles using sprouted seed or any other suitable source.
5. Study of Structure of any Prokaryotic and Eukaryotic Cell.
6. Microtomy: Fixation, Block making, section cutting double staining of animal tissues like liver, Oesophagus, stomach, Pancreas, Intestine, Kidney, Ovary testes.
7. Cell division in onion root tip/ insect gonads.
8. Preparation of Nuclear, Mitochondrial & Cytoplasmic Functions.

Suggested Reading

1. Karp, G.2010. Cell and Molecular Biology, Concepts and experiments 6th Edition. Jhon Wiley and sons. Inc
2. De Robertis, E.D.P. and De robertis, E.M.F. 2006 Cell and Molecular Biology8th Edition. Lippincott Williams and Wilkins, Philadelphin.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A molecular Approach. 5th Edition ASM Press & Sunderland, Washington, D.C.
4. Becker, W.M. ,Kleinsmith, L.J. , Hardin. J . and Barconi, G.P. 2009 The World of the cell. 7th Edition.

GE-1 CHEMISTRY

UNIT I

(12 Periods)

Chemical Energetics

Review of thermodynamics and the law of thermodynamics.

Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.

Statement of Third law of Thermodynamics and calculation of absolute entropies of a substance.

UNIT II(10 Periods)

Chemical Equilibrium:

Free energy change in a chemical reaction. Thermodynamic derivation of law of chemical equilibrium. Distinction Between δG and δG_o , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reaction involving ideal gases.

UNIT III

(12 Periods)

Ionic Equilibria

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis- calculation of hydrolysis constant degree of hydrolysis and pH scale for different salt. Buffer solutions. Solubility product of sparingly soluble salts- application of solubility product principle.

UNIT IV

(15 Periods)

Section B: Organic Chemistry

Basic (principles) in organic chemistry 1.(a) Shape and structure of organic compound, Tetravalence of Carbon: Hybridisation (sp^3 , sp^2 , sp) b: Classification and nomenclature of organic compounds.

1. Elementary idea of electron displacement effects, electronic effect.

Functional group approach for the following reaction (preparation and reactions) to be studied in context to their structure.

UNIT V

(8 Periods)

Aromatic Hydrocarbons

Preparation (case benzene): from phenol by Decarboxylation from acetylene from benzene sulphonic acid.

Reaction (case benzene): elementary idea of electrophilic substitution: Mechanism of nitration, halogenation and sulphonation. Directive influence of hydroxy, amino, halogen and nitro groups, Friedel craft's reaction (alkylation and acylation) (upto 4 carbon on benzene).

Side chain oxidation of alkyl benzenes (upto 4 carbon on benzene).

UNIT VI

(14 Periods)

Alcohols and phenols

Preparation: Preparation of 1°, 2° and 3° alcohols using Grignard reagent, ester hydrolysis, reduction of aldehydes, ketones, carboxylic acid and esters.

Reaction: With sodium, HX(Lucas test), esterification, oxidation (with PCC, alk. KMnO₄, acidic dichromate, conc. HNO₃) Oppeneauer oxidation diols: (upto 6 Carbons) oxidation of diols. Pinacol- Pinacolone rearrangement.

Preparation: Cumene Hydroperoxide method, From diazonium salts. Reactions: Electrophilic substitution: Nitration, Halogenation and sulphonation. Reimer Tiemann reaction, Gattermann Koch reaction, Houben- Hoesch Condensation, Schotten – Baumann Reaction. Aldehydes and Ketones: General methods of preparation, properties, ractions, Distinction between aldehyde and ketones. Aldol condensation, Baeyer’s Villigers oxidation.

Reference Books:

GrahamSolomon, T.W. Fryhle, C.B. &Dnyder, S.A. Organic chemistry, John Wiley & Sons (2014).

McMurry, J.E. Fundamentals of organic Chemistry, 7th Edition Cengage Learning India Edition 2013

Sykes, P.A Guidebook to mechanism in organic Chemistry, Orient Longman, New Delhi (1988).

Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S. Morrison, R.T. & Boyd, R.N Organic Chemistry, Pearson,2010.

Bahl, A. &Bahl, B.S Advanced Organic Chemistry, S. Chand, 2010.

Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007).

Castellan, G.W. Physical chemistry 4th edition. Narosa (2004).

Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).

Mahan, B.H. University Chemistry 3rd Edition. Narosa(1998).

Petrucci, R.H. General Chemistry 5th Edition. Macmillan Publishing Co. New York (1985)

AECC -1English Composition

UNIT -I

Prose/Short Stories

1. R.K. Narayan -An Astrologer's Day
2. Mulk Raj Anand – The Lost Child
3. Guy de Maupassant- The Diamond Necklace
4. Leo Tolstoy – Three Questions
5. O. Henry – The Gift of The Magi

UNIT – II

Poetry

1. Rabindranath Tagore – Where the Mind is Without Fear
2. Sarojini Naidu – The Soul's Prayer
3. Toru Dutt – The Lotus
4. John Donne – Death Be Not Proud

UNIT – III

(a) Grammar

Articles, Preposition, Subject – Verb agreement, Model Auxiliaries, Common Errors, Clauses and Sentences.

(b)Vocabulary

Synonyms, Antonyms, One word substitution, Idiomatic uses of Verbs & Phrases.

UNIT - IV

Written Communication.

Letter Writing, Application writing, Job Application With covering letter and C.V., Paragraph Writing, Precis Writing, Agenda, Minutes, Memorandum.

UNIT – V

Spoken Communication

Speech, Dialogue, Group Discussion, Interview, Exchanging Greeting and taking leave, Answering the Telephone, taking and leaving message, Calling for medical support in emergency, Stress and accent in Speech.

CC3- MAMMALIAN PHYSIOLOGY

UNIT I: Digestion and Respiration(15 Periods)

Digestion: Mechanisms of digestion & absorption of carbohydrates, protein, lipids and Nucleic Acids. Composition of bile, saliva, pancreatic, gastric and intestinal juice.

Respiration: Exchange of gases, transport of O₂ and CO₂, Oxygen Dissociation curve, chloride Shift.

UNIT II: Circulation (15 Periods)

Composition of blood, plasma proteins and their role, blood cells, Haemopoiesis, Mechanisms of coagulation of blood.

Mechanisms of working of heart: Cardiac output, cardiac cycle, origin and conduction of heartbeat.

UNIT III: Muscle physiology and Osmoregulation(15 Periods)

Structure of cardiac, smooth and skeletal muscle, threshold stimulus, All or none rule, single muscle twitch, muscle tone, isotonic and isometric contraction, physical, chemical & electrical events of mechanisms of muscle contraction.

Excretion: Modes of excretion, ornithine cycle, mechanisms of urine formation.

UNIT IV: Nervous and endocrine coordination (15 Periods)

Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction, salutatory conduction, Neurotransmitters.

UNIT V

Mechanisms of action of hormones (insulin and steroids)

Different endocrine glands- Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper secretions.

UNIT VI

PRACTICALS

1. Finding the coagulation time of blood.
2. Determination of blood groups.
3. Counting of mammalian RBCs.
4. Determination of TLC and DLC.
5. Demonstration of action of enzyme.
6. Determination of Haemoglobin.

SUGGESTED READING

1. Guyton, A.C. & Hall, J.E. (2006). Textbook of medical physiology. XI edition. Harcourt Asia PTE Ltd./W.B. Saunders Company.

2. Tortora, G.J. & Grabowski, S.(2006). Principles of Anatomy & physiology. XI edition. John Wiley and sons , Inc.

CC 4 – PLANT ANATOMY AND PHYSIOLOGY

UNIT I: Anatomy (10 Periods)

The shoot and root apical meristem and its histological organization, simple & complex permanent tissues, primary structure of shoot & root, secondary growth, growth rings, leaf anatomy (dorsi-ventral and isobilateral leaf)

UNIT II: Plant water relations and micro and macro nutrients(12 Periods)

Plant water relations: Importance of water to plant life, diffusion, osmosis, plasmolysis, imbibition, gutation, transpiration, stomata & their mechanism of opening& closing.

UNIT III

Micro and macro nutrients: Criteria for identification of essentiality of nutrients, roles and deficiency systems of nutrients, mechanism of uptake of nutrients, mechanism of food transport

UNIT IV: Carbon and nitrogen metabolism (20 Periods)

Photosynthesis- Photosynthesis pigments, concepts of two photosystem, photophosphorylation, calvin cycle, CAM plants, photorespiration, compensation point.

Nitrogen metabolism- inorganic and molecular nitrogen fixation, nitrate reduction and ammonium assimilation in plants.

UNIT V: Growth and development(18 Periods)

Growth and development: Definitions, phases of growth, growth curve, growth hormones(auxins, gibberlins, cytokinins, abscisic acid, ethylene)

Physiological role and mode of action, seed dormancy and seed germination, concept of photoperiodism and vernalization

UNIT VI

PRACTICALS

1. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
2. Demonstration of plasmolysis by tradescantia leaf peel.
3. Demonstration of opening and closing of stomata.
4. Demonstration of guttation on leaf tips of grass and garden nasturtium.
5. Separation of photosynthetic pigments by paper chromatography.
6. Demonstration of aerobic respiration.
7. Preparation of root nodules from a leguminous plant.

SUGGESTED READING

1. Dickinson, W.C. 2000 Integrative plant Anatomy. Harcourt Academic Press, USA.
2. Esau, K.1977 Anatomy of seed plants. Wiley Publishers.
3. Fahh, A. 1974 plant Anatomy. Pergmon Press, USA and UK.
4. Hopkins, W.G. and Huner, P.A. 2008 Introduction to plant Physiology. John Wiley and Sons.
5. Mauseth, J.D. 1988 Plant Anatomy. The Benjamin/Cummings Publisher, USA.
6. Nelson, D.L., Cox, M.M.2004 Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA.
7. Salisbury, F.B. and Ross, C.W. 1991 Plant physiology, Wadsworth publishing Co. Ltd.
8. Taiz, L. and Zeiger, E.2006 Plant Physiology 4th edition Sinauer Associates Inc. MA, USA.

GE– 2 CHEMISTRY

UNIT I

1. Chemical Kinetics: Rate and reaction, order and Molecularity of reaction, First and second order reactions, determination of the order of reaction. The effect of temperature on reaction rates, energy of activation.

2. Electrochemistry: conductance of electrolytes, weak and strong electrolytes, specific conductance, equivalent conductance and molecular conductance their experimental determination, variation of conductance with dilution, Ostwald's Dilution law, Solubility principle, application of solubility product concept in precipitation reactions, hydrolysis of salts, acid and bases(Bronsted Lowry and Lewis), pH and Buffer solutions, Common ion effect.

UNIT III

3. Electrochemical cells, Reversible and irreversible Electrode and cell potential, origin of electrode potential, concentration cells, E.M.F. of concentration cell without transference, Application of E.M.F. measurements for the determination of solubility product of sparingly soluble salts and valency of ions.
4. Radioactivity: Alpha, beta and gama rays, isotopes, isobars and isotones, group displacement law, induced radioactivity, balancing of nuclear reactions, half life, average life, radioactive series, radio carbon dating

UNIT III

5. Isomerism (a) structural (b) stereoisomerisms.
6. Hydroxyacids: Lactic Acid, Tartaric acid, citric acid(isolation, synthesis, Properties, Constitution, Geometrical and optical isomerism, symmetry, resolution of racemic compounds.)

UNIT IV

7. Carbohydrates: Classification, nomenclature, structure of glucose and fructose. Concept of open chain structure and mention the ring structure (derivation of ring structure not required), elementary idea about configuration.
8. Benzene and its monosubstituted products: Toluene, nitrobenzene, aniline, benzene diazonium chloride, phenol, benzaldehyde, benzenesulphonic acid, benzoic acid (preparation, properties and uses). The reaction involved in the study of Perkin, Cannizzaro, Kolbe, Reimer Tiemann, Sandmeyer's reactions.

UNIT V

9. Modern periodic table and periodic properties.
10. General chemistry of the d-block elements: (special reference to 3d)
electronic configuration, Oxidation states, Atomic and ionic radius, Magnetic Properties, Standard electrode Potentials, Ionisation Energies, Variable valency and coloured compounds, Complex formation and catalytic properties.

UNIT VI

11. Coordination compounds: Double salts and coordination compound, Nomenclature :Systematic approach to coordination compounds with reference to cobalt- amines, Werner's theory, Elementary idea of isomerism, Sidgwick theory of effective atomic number, Idea of valence bond theory.

12. The chemistry of individual elements and their compounds: A part from the aspects mentioned below: the studies of the elements must be made with reference to (i) electronic configuration, (ii) acid base character, (iii) general chemical reactions of the elements and their compounds, (iv) tests for ions and radicals formed by the elements and their compounds, (v) Shapes and structure of the covalent compound formed by the elements.

Ability enhancement compulsory course (AECC 2- Environmental studies)

UNIT I: Introduction to environmental studies (2 lectures)

Multidisciplinary nature of environmental studies:

Scope and importance: Concept of sustainability and sustainable development.

UNIT II (6 lectures) **Ecosystem**

What is an ecosystem? Structure and function of ecosystem: energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following Ecosystem:

- a) Forest ecosystem
- b) Grassland ecosystem
- c) Desert ecosystem
- d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT III(8 lectures)**Natural resources: Renewable and non renewable resources**

Land resources and land use change: land degradation, soil erosion and desertification. **Deforestation:** Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. **Water:** use and over exploitation of surface and ground water, floods, Droughts, conflicts over water (international & inter- state). **Energy resources:** Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT IV: Biodiversity and conservation(8 lectures)

Levels of biological diversity: genetic, species and ecosystem diversity:
Biogeographic zones of India, biodiversity patterns and global biodiversity hot spots.

India as a mega biodiversity nation: Endangered and endemic species of India.

Threats to biodiversity: Habitat loss, poaching of wildlife, man- wildlife conflicts, biological invasions: Conservation of biodiversity: In-situ and Ex-situ conservation of Biodiversity.

Ecosystem and biodiversity services: Ecological, Economic, Social, Ethical, aesthetic and Informational Value.

UNIT V: Environmental pollution(7 lectures)

Environmental pollution: types, causes, effects and controls: Air, water, soil and noise pollution.

Nuclear hazards and human health risks
Solid waste management: Control measures of urban and industrial waste. Pollution case studies.

Environmental Laws: Environmental protection Act: Air (prevention and control of pollution) Act, Water(prevention and control of pollution) Act, wildlife protection act, forest conservation act, International agreements: Montreal and Kyoto protocols and convention on biological diversity (CBD).

Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

UNIT VI: Field work (5 lectures)

Visit to an area to document environmental assets: River/forest/flora/fauna, etc. Visit to a local polluted site – Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystem- pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin, Harcourt.
2. Gadgil, M., & Guha, R. 1993. This fissured Land: An ecological history of India, Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999 Global ethics and Environment, London, Routledge.

4. Gleick, P.H. 1993. water in crisis. Pacific institute for studies in Dev., Environmental & security, Stockholm Env. Institute , Oxford Univ. Press.
5. Groom, Martha J., Gary K. meffe, and carl Ronald Carroll. Principle of conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and pandit, M.K. 2013 Threats from India's Himalaya dams. Science 339:36—37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams(pp.29—64).Zed books.
8. McNeill, John R. 2000. Something New under the sun: An environmental History of the twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology, Philadelphia:Saunders.
10. Pepper, I.L., Gerba C.P. &Brusseau, M.L. 2011. Environmental and pollution science. Academic press.
11. Rao, M.N. &Datta, A.K. 1987 Waste water treatment, Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & berg, L.R. 2012. Environment. 8th edition John Wiley and sons.
13. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.

CC 5- GENETICS

UNIT I

(12 periods)

Introduction: Historical developments in the field of genetics. Organisms suitable for genetic experimentation and their genetic significance.

Cell cycle: Mitosis and Meiosis: control points in cell-cycle progression in yeast. Role of meiosis in life cycle of organisms.

Mendelian genetics: Mendel experimental design, monohybrid, di-hybrid, and tri-hybrid crosses, Law of segregation & Principle of independent assortment. Verification of segregates by test and back crosses, chromosomal theory of inheritance. Allelic interactions: Concept of dominance, recessiveness, incomplete dominance, semi-dominance, pleiotropy, multiple allele, pseudo-allele, essential and lethal genes, penetrance and expressivity.

UNIT II

(18 periods)

Non allelic interaction: interaction producing new phenotype, complementary genes, epistasis(dominant & recessive), duplicate genes and inhibitory genes. Chromosome and genomic organization: eukaryotic nuclear genome nucleotide sequence composition- unique and repetitive DNA, satellite DNA. Centromere and telomere DNA sequences, middle repetitive sequences-VNTRs & dinucleotide repeats, repetitive transposed sequences-SINEs & LINEs, middle repetitive multiple copy genes, noncoding DNA. Genetic organization of prokaryotic and viral genome.

Structure and characteristics of bacterial and eukaryotic chromosome, chromosome morphology, concept of euchromatin and heterochromatin. Packaging of DNA molecule into chromosome, chromosome banding pattern, karyotype, giant chromosomes, one gene one polypeptide hypothesis, concept of cistron, exons, introns, genetic code, gene function.

UNIT III

(15 periods)

Chromosome and gene mutation: Definition and types of mutation, causes of mutations, Ames test for mutagenic agents, screening procedures for isolation of mutants and uses of mutant, variations in chromosomes structure- deletion, duplication, inversion and translocation (reciprocal and Robertsonian), position effect of gene expression, chromosomal aberrations in human beings, abnormalities- Aneuploidy and euploidy.

Sex determination and sex linkage: Mechanisms of sex determination, environmental factors and sex determination, sex differentiation, Barr bodies, dosage compensation, genetic balance theory, Fragile -X- syndrome and chromosome, sex influenced dominance, sex limited gene expression, sex linked inheritance.

UNIT - IV

(15 periods)

Genetic linkage, crossing over and chromosome mapping: Linkage and recombination of genes in a chromosome crossing over, cytological basis of crossing over, molecular mechanism of crossing over, crossing over at four strand stage, multiple crossing overs genetic mapping. Extra chromosomal inheritance: Rules for extra nuclear inheritance, maternal effects, maternal inheritance, cytoplasmic inheritance, organelle heredity, genomic imprinting. Evolution and population genetics: in breeding and out breeding, Hardy Weinberg law (prediction, derivation), allelic and genotype frequencies, change in allelic frequencies, systems of mating, evolutionary genetics, natural selection.

UNIT-V

PRACTICALS –

1. Permanent and temporary mount of mitosis.
2. Permanent and temporary mount of meiosis.
3. Mendelian derivations in dihybrid crosses.
4. Demonstration of – Barr Body- Rhoeo translocation.
5. Karyotyping with the help of photographs.
6. Pedigree charts for some characters like blood group, color blindness and PTC tasting.
7. Study of polyploidy in onion root tip by colchicines treatment.

SUGGESTED READING

1. Gardner, E.J., Simmons, M.J., Snustad, D.P.(2006). Principles of Genetics. VIII Edition John Wiley & Sons.
2. Snustad D.P., Simmons, M.J.,(2009). Principles of Genetics. V Edition John Wiley & Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A.(2006). Concepts of Genetics. IX Edition. Benjamin Cummings.
4. Russell, P.J.(2009). Genetics A Molecular Approach. III edition. Benjamin Cummings.
5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Corroll, S.B. IX edition. Introduction to Genetic Analysis, W.H. Freeman & Co.

CC -6 GENERAL MICROBIOLOGY

UNIT I

(10 periods)

Fundamentals , history and evolution of microbiology.

Classification of microorganisms: Microbial taxonomy, criteria used including molecular approaches, microbial phylogeny and current classification of bacteria.

Microbial diversity: Distribution and characterization prokaryotic and eukaryotic cells, Morphology and cell structure of major groups of microorganisms Eg.

Bacteria, Algae, Fungi, Protozoa, and unique features of viruses.

UNIT- II

(10 periods)

Cultivation and maintenance of microorganisms: Nutritional categories of microorganisms, methods of isolation, purification and preservation.

UNIT-III

(20 periods)

Microbial growth: Growth curve, generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria.

Microbial Metabolism: Metabolic pathways, Amphi-catabolic and biosynthetic pathways

Bacterial Reproduction: Transformation, Transduction and conjugation.
Endospores and sporulation in bacteria.

UNIT- IV

(20 periods)

Control of microorganisms: By physical, chemical, and chemotherapeutic agents
water

Microbiology: Bacterial pollutants of water, coliforms and non coliforms. Sewage
composition and its disposal.

Food Microbiology: Important microorganisms in food microbiology: Moulds,
Yeasts, bacteria.

Major food born infections and intoxications, preservation of various type of
foods. Fermented Foods

UNIT - V

Practicals

1. Isolation of bacteria & their biochemical characterization.
2. Staining methods: Simple staining, gram staining, spore staining, negative staining, hanging drop.
3. Preparation of media & sterilization methods, Methods of isolation of bacteria from different sources.
4. Determination of bacterial cell size by micrometry.
5. Enumeration of microorganisms – total and viable count.

SUGGESTED READING

1. Alexopoulos CJ, Mims CW, and Blackwell M.(1996). Introductory Mycology. 4th edition. John and sons, Inc.
2. Jay JM, Loessner MJ and Golden DA.(2005).Modern Food Microbiology. 7th edition CBS publisher and distributors, Delhi, India.
3. Kumar HD.(1990). Introductory phycology.2nd Edition. Affiliated East Western Press.
4. Madigan MT, Martinko JM and parker J.(2009). Brock biology of microorganisms. 12th edition. Pearson/Benjamin Cummings.
5. Pelczar MJ,Chan ECS and Krieg NR.(1993). Microbiology. 5th edition. McGraw Hill book and company.
6. Stanier RY, ingraham JL, Wheelis ML, and painter PR.(2005) General microbiology 5th edition.

CC 7- RECOMBINANT DNA TECHNOLOGY

UNIT I

(15 periods)

Molecular tools and applications- restriction enzymes, ligases, polymerases, alkaline phosphatase, Gene recombination and gene transfer: transformation, episomes, plasmids and other cloning vectors(bacteriophage- derived vectors, artificial chromosomes), microinjection, electroporation, ultrasonication, principle and application of polymerase chain reaction(PCR), primer design, and RT(reverse transcription) PCR.

UNIT II

(20 periods)

Restriction and modification system, restriction mapping. Southern and northern hybridization. Preparation and comparison of genomic and cDNA library, screening of recombinants, reverse transcription, genome mapping, DNA fingerprinting, applications of genetic engineering.

Genetic engineering in animals: production and applications of transgenic mice, role of ES cells in gene targeting in mice, therapeutic products produced by genetic engineering- blood proteins, human hormones, immune modulators and vaccines (one example each).

UNIT III

(10 periods)

Random and site-directed mutagenesis: Primer extension and PCR based methods of site directed mutagenesis, Random mutagenesis, Gene shuffling, production of chimeric proteins, protein engineering concepts and examples (any two).

UNIT IV

(15 periods)

Genetic engineering in plants: uses of *Agrobacterium tumefaciens* and *A. rhizogenes*, ti plasmids, strategies for gene transfer to plants cells, Direct DNA transfer to plants, gene targeting in plants, uses of plants viruses as episomal expression vectors.

UNIT V

PRACTICALS

1. Isolation of chromosomal DNA from plants cells.
2. Isolation of chromosomal DNA from *E. coli*.

3. Qualitative and quantitative analysis of DNA using spectrophotometer.
4. Plasmid DNA isolation.
5. Restriction digestion of DNA.
6. Making competent cells.
7. Transformation of competent cells.
8. Demonstration of PCR.

SUGGESTED READING

1. Brown TA. (2006). Gene Cloning and DNA Analysis. 5th edition. Blackwell publishing, Oxford, U.K.
2. Clark DP. and Pazdernik NJ. (2009) Biotechnology- Applying the genetic revolution. Elsevier Academic press, USA.
3. Glick, B.R., Pasternak, J.J.(2003). Molecular Biotechnology- principles and application of recombinant DNA. ASM press, Washington.
4. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and genomics, 7th edition. Blackwell publishing, Oxford, U.K.
5. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning- A laboratory Manual. 3rd edition. Cold spring harbor laboratory press.

GE–3 BIOSTATISTICS

UNIT I

(12 periods)

Types of Data, Collection of Data: primary & secondary data, classification and graphical representation of statistical data. Measures of central tendency and dispersion. Measures of skewness and Kurtosis.

UNIT II

(18 periods)

Probability classical & axiomatic definition of probability, Theorems on total and compound probability, Elementary ideas of Binomial, Poisson and Normal Distributions.

UNIT III

(18 periods)

Methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, chi-square test for goodness of fit and analysis of variance(ANOVA)

UNIT IV

(12 periods)

Correlation and regression. Emphasis on examples from Biological Sciences.

SUGGESTED READING

1. Le CT (2003) Introductory biostatistics. 1st edition, Jhon Wiley, USA.
2. Glaser AN (2001) High Yield TM Biostatistics. Lippincott Williams and Wilkins, USA.
3. Edmondson A and Druce D (1996) Advanced Biology Statistics, Oxford University Press.
4. Danial W (2004) Biostatistics: A foundation for analysis in health Sciences, John Wiley and sons Inc.

SEC 1 – ENZYMOLOGY

UNIT I

(20 periods)

Isolation, crystallization and purification of enzymes, test of homogeneity of enzyme preparation, methods of enzyme analysis.

Enzyme classification(rationale, overview and specific examples) zymogens and their activation(proteases and prothrombin).

Enzyme substrate complex: concept of E-S complex, binding sites, active site, specificity, kinetics of enzymes activity, Michaelis-Menten Equation and its derivation.

Different plots for the determination of K_m and V_{max} and their physiological significance, factors affecting initial rate , E, S, temp. & pH. Collision and transition state theories, Significance of activation energy and free energy.

UNIT II

(15 periods)

Two substrate reactions (Random, ordered and ping-pong mechanism) enzyme inhibition, types of inhibition, determination of K_i , suicide inhibitor.

Mechanism of enzyme action: general mechanistic principle, factors associated with catalytic efficiency: proximity, orientation, distortion of strain, acid-base, nucleophilic and covalent catalysis. Techniques for studying mechanisms of action, chemical modification of active site groups, specific examples-: Chymotrypsin, Isozyme, GPDH, Aldolase, RNase, Carboxypeptidase and alcohol dehydrogenase.

Enzyme regulation: product inhibition, Feed- back control, covalent modification.

UNIT III

(13 periods)

Allosteric enzymes with specific reference to aspartate transcarbamoylase and phosphofructokinase. Qualitative description of concerted and sequential models. Negative cooperativity and half site reactivity.

Enzyme – enzyme interaction, protein ligand binding, measurements analysis of binding isotherm, cooperativity, Hill and scatchard plots, kinetics of allosteric enzymes. Isoenzymes- multiple forms of enzyme with special reference to lactate dehydrogenase. Multienzyme complexes. Ribozymes. Multifunctional enzyme –eg Fatty Acid synthase.

UNIT IV

(12 periods)

Enzyme technology: methods of large scale production of enzymes. Immobilized enzyme and their comparison with soluble enzymes. Methods for immobilization of enzymes. Immobilized enzymes reactors. Application of immobilized and soluble enzyme in health and industry.

Application to fundamental studies of biochemistry. Enzyme electrodes. Thermal stability and catalytic efficiency of enzyme, site directed mutagenesis an enzyme engineering- selected examples, delivery system for protein pharmaceuticals, structure function relationship in enzymes, structural motifs and enzyme evolution.

Methods of protein sequencing. Methods of analysis of secondary and tertiary structures of enzymes.

Protein folding *invitro* & *invivo*.

UNIT V

PRACTICALS

1. Purification of an enzyme from any natural resource.
2. Qualitative estimation of proteins by Bardford/Lowry's method.
3. Perform assay for the purified enzyme.
4. Calculation of kinetic parameters such as K_m , V_{max} , K_{cat} 4th edition.
Elsevier

CC8- MOLECULAR BIOLOGY

UNIT I: DNA structure and replication

(15 periods)

DNA as genetic material, structure of DNA, types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semiconservative nature of DNA replication, Bi-directional replication, DNA polymerase. The replication complex: pre-priming proteins, primosomes, replisome, Rolling circle replication, unique aspects of eukaryotic chromosome replication, Fidelity of replication.

UNIT II: DNA damage, Repair and homologous recombination(10 periods)

DNA damage and repair: Causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombinational repair, nonhomologous end joining. Homologous recombination: models and mechanism.

UNIT III: Transcription and RNA processing

(17 periods)

RNA structure and types of RNA, transcription in prokaryotes: Prokaryotic RNA polymerase, Role of sigma factor, promoter, Initiation, elongation and termination of RNA chains Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT IV: Regulation of gene expression and translation

(18 periods)

Regulation of gene expression in prokaryotes: Operon concept(inducible and repressible system), genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, fidelity of translation, inhibitors of translation, posttranslational modification of proteins.

PRACTICALS

1. Preparation of solution for Molecular Biology experiments.
2. Isolation of chromosomal DNA from bacterial cells.
3. Isolation of plasmid DNA by alkaline lysis methods.
4. Agarose gel electrophoresis of genomic DNA & plasmid DNA.
5. Preparation of restriction enzyme digests of DNA samples.
6. Demonstration of AMES test or reverse mutation for carcinogenicity.

SUGGESTED READING

1. Karp, G.(2010). Cell and Molecular Biology: Concepts and experiments. VI edition. John Wiley and Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G.P.(2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
4. Watson, J.D., Baker T.A., Bell, S.P., Gann, A., Levine, M., and Losick, R., (2008) Molecular Biology of the Gene(VI Edition). Cold spring Harbour Lab. Press, Pearson Pub.

CC9- IMMUNOLOGY

UNIT I

(20 periods)

Immune response – an overview, components of mammalian immune system, Molecular structure of immune-globulins or antibodies, Humoral and cellular immune responses, T- lymphocytes & immune response(cytotoxic T-cell, helper T-cell, suppressor T-cells), T-cell receptors, genome rearrangements during B-lymphocyte differentiation, antibody affinity maturation class switching, assembly of t-cell receptor genes by somatic recombination.

UNIT II I

(15periods)

Regulation of immunoglobulin gene expression- clonal selection theory, allotypes & idiotypes, allelic exclusion, immunologic memory, heavy chain gene transcription, genetic basis of antibody diversity, hypothesis(germ line & somatic mutation), antibody diversity.

UNIT III I

(13 periods)

Major Histocompatibility complexes – class I and class II MHC antigens, antigen processing. Immunity to infection- immunity to different organisms, pathogen defense strategies, avoidance of recognition. Autoimmune diseases, Immunodeficiency- AIDS.

UNIT IV I

(12 periods)

Vaccines & Vaccination- adjuvants, cytokines, DNA vaccines, Recombinant vaccines, bacterial vaccines, viral vaccines, vaccines to other infectious agents, passive & active immunization. Introduction to immunodiagnostics- RIA, ELISA.

PRACTICALS

1. Differential leucocytes count.
2. Total leucocytes count.
3. Total RBC count.
4. Haemagglutination assay.
5. Haemagglutination inhibition assay.
6. Separation of serum from blood.
7. Double immunodiffusion test using specific antibody and antigen.
8. ELISA.

SUGGESTED READING

1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.
2. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley- Blackwell Scientific Publication, Oxford.
3. Goldsby RA, Kindt TJ, Osborne BA. (2007) Kuby's Immunology. 6th Edition W.H. Freeman and Company, New York.
4. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.
5. Peakman M, and Vergani D.(2009). Basic and clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinburgh.
6. Richard C and Geoffrey S.(2009). Immunology.6th edition. Wiley Blackwell Publication.

CC 10- PLANT DIVERSITY

UNIT I

Algae: I

(20 periods)

General character, classification and economic importance. Life histories of algae belonging to various classes:

Chlorophyceae- *Volvox*, *Oedogonium*

Xanthophyceae- *Vaucheria*

Phaeophyceae – *Ectocarpus*

Rhodophyceae – *Polysiphonia*

UNIT II

Fungi: I

(20 periods)

General character, classification and economic importance.

Life histories of fungi:

Mastigomycotina – *Phytophthora*

Zygomycotina – *Mucor*

Ascomycotina – *Saccharomyces*

Basidiomycotina – *Agaricus*

Deutromycotina – *Colletotrichum*

UNIT III

Lichens: I

(10 periods)

Classification, general structure, reproduction and economic importance. Plant diseases: 4 of 36

Causal organism, symptoms and control of following plant diseases.

Rust and smut of Wheat.

White rust of Crucifers.

Late blight of Potato.

Red root of Sugarcane.

Citrus Canker

UNIT IV

Bryophytes: I

(10 periods)

General characters, classification & economic importance.

Life histories of following:

Marchantia

Funaria

PRACTICALS

1. Comparative study of thallus and reproductive organs of various algae mentioned in theory.
2. Comparative study of vegetative and reproductive parts of various fungi mentioned in theory.
3. Study of section cutting and lactophenol mount of plant disease material studied in theory.
4. Study of various types of Lichens.
5. Study of external features & anatomy of vegetative and reproductive parts of *Marchantia* and *Funaria*.
6. Collection of algae, fungi, plant diseases materials and bryophytes available locally.

SUGGESTED READING

1. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W. and Blackwell, m. 1996 Introductory Mycology, 4th edition, John Wiley and Sons(Asia) Singapore.
3. Bold, H.C. & Wayne, M.J. 1962(2nd Ed.) introduction to Algae.
4. Kumar, H.d. 1999. Introductory Phycology. Aff. East-west presss Pvt Ltd., Delhi.
5. Lee, R.E. 2008. Phycology, Fourth Edition, Cambridge University Press, USA.
6. Sambamurty 2008 A textbook of Bryophytes, Pteridophytes, Gymnosperms and paleobotany. IK International Publishers.

7. Shaw, A.J. and Goffinet, B. 2008 Bryophyte Biology. Cambridge university Press.
8. Van den hoek, C. Mann, D.J & Jahns, H.M. 1995. Algae: An Introduction to Phycology, Cambridge Univ. Press
9. Vander-Poorteri 2009 Introduction to Bryophytes. COP.
10. Webster, J. and Weber, R. 2007 Introduction to Fungi. 3rd edition, Cambridge University Press, Cambridge.
11. Wickens, G.E. 2004 Economic Botany: Principles and Practices, Springer. Kuwer Publishers, Dordrecht, The Netherlands.

GE- 4 DEVELOPMENTAL BIOLOGY

UNIT I : Gametogenesis and Fertilization

(10 periods)

Definition, scope & perspective of developmental Biology, Gametogenesis- Spermatogenesis, Oogenesis, Fertilization- Definition, mechanism, types of fertilization. Different types of eggs on the basis of yolk.

UNIT II : Early embryonic development

(20 periods)

Cleavage: Definition, types, Patterns & mechanism. Blastulation: Process, types & mechanism. Gastrulation: Morphogenetic movements- epiboly, emboly, extention, invagination, convergence, de-lamination. Formation and Diffrentiation of Primary germ layers, Fate Maps in early embryos.

UNIT III: Embrayonic Diffrentiation

(20 periods)

Differentiation: Cell commitment and determination- the epigenetic landscape: a model of determination and differentiation, control of differentiation at the level of genome, transcription and post translation level concept of embryonic induction: Primary, secondary & tertiary embryonic induction, Neural induction and induction of Vertebrate lens.

UNIT IV: Organogenesis

(10 periods)

Neurulation, ontogenesis, development of vertebrate eye. Fate of different primary germ layers. Development of behavior: constancy and plasticity, Extra embryonic membranes, placenta in Mammals.

SUGGESTED READING

1. Gilbert, S.F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
2. Balinsky, B.I.(2008). An Introduction to Embryology, International Thomson Computer Press.
3. Kalthoff, (2000). Analysis of Biological development, II edition, McGraw-Hill Professional.

SKILL ENHANCEMENT COURSE (SEC 2) MOLECULAR DIAGNOSTICS

UNIT I: Enzyme Immunoassays:

(15 periods)

Comparison of enzymes available for enzyme immunoassays, conjugation of enzymes. Solid phases used in enzyme immunoassays. Homogeneous and heterogeneous enzyme immunoassays. Enzyme immunoassays after immune blotting. Enzyme immune histochemical techniques. Use of polyclonal and monoclonal antibodies in enzyme immune assays. Application of enzyme immunoassays in Diagnostics Microbiology.

UNIT II

(15 periods)

Molecular methods in clinical microbiology:

Application of PCR, RFLP, Nuclear hybridization methods, single nucleotide polymorphism and plasmid fingerprinting in clinical microbiology.

Laboratory test in chemotherapy: susceptibility test: Micro- dilution and macro-dilution broth procedures.

Susceptibility tests: Diffusion test procedures. Susceptibility tests: test for bacterial activity. Automated procedures for antimicrobial susceptibility tests.

UNIT III II

(18 periods)

Automation in microbial diagnosis, rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies. Concepts and methods in idiotypes. Antidiotypes and molecular mimicry and receptors.

Epitope design and applications. Immunodiagnosics test. Immune florescence.

Radioimmunoassay.

UNIT IV II

(12 periods)

GLC, HPLC, Electron Microscopy, Flowcytometry and cell sorting.

Transgenic animals.

PRACTICALS

(wherever wet labs experiments are not possible the principle and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

1. Perform /demonstrate RFLP and its analysis
2. Kirby- Bauer method (disc- diffusion method) to study antibiotic sensitivity of a bacterial culture
3. A kit based detection of microbial infection (Widal test)
4. Study of electron micrographs (any four).
5. Perform any one immune diagnostic test (Typhoid, Malaria, Dengue).

SUGGESTED READING

1. Practical biochemistry, principles and techniques, Keith Wilson and John Walker
2. Bioinstrumentation, Webster.
3. Advanced instrumentation, Data interpretation, and control of biotechnological processes, J.F. Van empe, Kluwer Academic.
4. Ananthanarayan R and Paniker CKJ. (2005). Textbook of Microbiology. 7th edition (edited by Paniker CKJ). University Press Publication.
5. Brooks GF, CarRoll KC, Butel JS and Morse SA. (2007). Jawetz, Melnick and Adelberg's Medical Microbiology. 24th edition. McGraw Hill Publication.
6. Georing R, Dockrell H, Zukerman M and Wakelin D. (2007). Mims' Medical Microbiology.
7. Joklik WK, Willet HP and Amos DB (1995). Zinsser microbiology. 19th edition. Appleton Century- Crofts Publication.
8. Wiley JM, Sherwood LM, and Woolvertan CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
9. Microscopic Techniques in Biotechnology, Michael Hoppert.

CC 11 – GENOMICS AND PROTEOMICS

UNIT I

(15 periods)

Introduction to Genomics, DNA sequencing methods- manual and automated: Maxam & Gilbert and Sangers Methods. Pyrosequencing. Genome sequencing: Shotgun and Hierarchical (clone contig) methods, computer tools for sequencing projects: genome sequence assembly software.

UNIT II

(10 periods)

Managing and distributing genome data: web based servers and software for genome analysis: ENSEMBL, VISTA, UCSC, Genome Browser, NCBI Genome, Selected model Organisms' Genomes and databases.

UNIT III

(20 periods)

Introduction to protein structure, chemical properties of proteins. Physical interaction that determine the property of proteins. Short Range Interaction, electrostatic Forces, van der waal interactions, hydrogen bonds, hydrophobic interactions. Determination of Sizes(Sedimentation analysis, gel filtration, SDS-PAGE): Native PAGE, determination of Covalent structures- Edman degradation.

UNIT IV

(15 periods)

Introduction to proteomics, Analysis of proteomes. 2D –PAGE. Sample separation, solubilization, reduction, resolution.

Reproducibility of 2D –PAGE. Mass spectrometry based methods for protein identification. De novo sequencing using mass spectrometric data.

PRACTICALS

1. Use of SNP database at NCBI and other sites.
2. Use of OMIM database.
3. Detection of open reading frames using ORF finder.
4. Proteomics 2D PAGE database.
5. Softwares for protein localization.
6. Hydrophaty plots.
7. Native PAGE.
8. SDS – PAGE

SUGGESTED READING

1. Gene IX by Benjamin Lewin, Johns and Bartlett Publishers, 2006.
2. Modern Biotechnology, 2nd edition, S.B. primrose, Blackwell Publishing, 1987.
3. Molecular Biotechnology: Principle and application of recombinant DNA, 4th edition, B.R. Glick, J.J. Pasternak and C.L. Patten 2010.
4. Molecular cloning: A laboratory Manual (3rd edition) Sambrook and Russell Vol. I to III, 1989.
5. Principles of gene Manipulation 6th edition, S.B. Primrose, R.m. Twyman and R.W. Old Blackwell Science, 2001.

6. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V edition. John Wiley and Sons Inc.
7. Klug, W.S., Cummings, M.R., Spencer, C.A.(2009) Concepts of Genetics. IX Edition. Benjamin Cummings.
8. Russell, P.J.(2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
9. Glick, B.R., Pasternak, J.J.(2003). Molecular Biotechnology- Principles and Application of recombinant DNA. ASM press, Washington.
- 10.Pevsner, J.(2009). Bioinformatics and Functional Genomics. II Edition. John Wiley and Sons.

CC12- BIOTECHNOLOGY AND HUMAN WELFARE

UNIT I

(10 periods)

Industry: protein engineering: enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation.

UNIT II

(10 periods)

Agriculture: N₂ Fixation: transfer of pest resistance gene to plants: interaction between plants and microbes: qualitative improvement of livestock.

UNIT III

(15 periods)

Environment: e.g. chlorinated and non chlorinated organ pollutant degradation: degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB.

UNIT IV

(12 periods)

Forensic Science: e.g. solving violent crimes such as murder and rape: solving claims of paternity and theft etc. using different methods of DNA finger printing.

UNIT V

(13 periods)

Health: e.g. development of non toxic therapeutic agents recombinant live vaccines, gene therapy, diagnostics, Monoclonal in E.coli, Human genome project.

SUGGESTED READING

1. Sateesh MK(2010) Bioethics and Biosafety, I.K. International Pvt. Ltd.
2. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers.

DISCIPLINE CENTRIC SUBJECTS (DSE)

DSE 01 BIOINFORMATICS

UNIT I

(10 periods)

History of Bioinformatics. The nation of Homology. Sequence information sources, EMBL, GENBANK, Entrez, Unigene, Understanding the structure of each source and using it on web.

UNIT II

(20 periods)

Protein information source, PDB, SWISSPROT, TREMBL, understanding the structure of each source and using it on web. Introduction of data generating

techniques, and Bioinformatics problem posed by them- Restriction Digestion, Chromatograms, Blots, PCR, Microarrays, Mass spectrometry.

UNIT III

(20 periods)

Sequence and phylogeny analysis, Detecting open reading frames, Outline of sequence assembly, Mutation/Substitution Matrices, Pairwise Alignments, Introduction to BLAST, Using it on web. Interpreting Results, Multiple sequence Alignment, Phylogenetic Analysis.

UNIT IV

(15 periods)

Searching Database: SRS, Entrez, Sequence Similarity Searches- BLAST, FASTA, Data submission.

Genome annotation: Pattern and repeat Finding, gene identification tools.

PRACTICALS

1. Sequence information resource.
2. Understanding the use of various web resources: EMBL, Genbank, Entrez, Unigene, Protein information resource(PIR).
3. Understanding and using: PDB, Swissport, TREMBL.
4. Using different BLAST and interpretation of results.
5. Retrieval of information from nucleotide databases.

6. Sequence of alignment using BLAST.
7. Multiple sequence alignment using Clustal W.

SUGGESTED READING

1. Ghosh Z. and Bibekanand M.(2008) Bioinformatics: principles and application , Oxford University Press.
2. Pevsner J.(2009) Bioinformatics and Functional Genomics. II Edition. Wiley – Blackwell.
3. Campbell A.M., Heyer L.J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II edition. Benjamin Cummings.

DSE 02 ENVIRONMENTAL BIOTECHNOLOGY

UNIT I

(18 periods)

Conventional fuels and their environmental impact- Firewood, Plant, Animal, Water, Coal and Gas. Modern Fuels and their environmental impact-

methanogenic bacteria, Biogas, Microbial Hydrogen Production, Conversion of Sugar to alcohol gasohol.

UNIT II (20 periods)

Bioremediation of soils and water contaminated with oils spills, Heavy metals and detergents. Degraation of Lignin and cellulose using microbes. Phyto Remidaition. Degradation of Pesticides and other toxic chemicals by micro organisms – degradation aromatic and chlorinates hydrocarbons and petroleum products.

UNIT III (12 periods)

Treatment of municipal waste and industrial effluents. Bio-fertilizers
Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil.
Algal and fungal Biofertilizers(VAM).

UNIT IV (10 periods)

Bioleaching, Enrichment of ores by microorganisms (Gold, Cooper and Uranium).environmental significance of genetically modified microbes, Plant and Animals.

PRACTICALS

1. Calculation of Total Dissolved Solids(TDS) of water sample.
2. Calculation of BOD of water sample.
3. Calculation of COD of water sample.
4. Bacterial Examination of water by MPN Method.

SUGGESTED READING

1. Environmental Science, S.C, Santra.
2. Environmental Biotechnology, Pradipta Kumar Mahopatra.
3. Environmental Biotechnology- concepts and application, Hans Joachim Jordening and Jesef winter.
4. Waste Water Engineering, Metcalf and Eddy, Tata McGraw Hill
5. Agricultural Biotechnology, S.S. Purohit.
6. Environmental Microbiology: Methods and Protocols, Alicia L. Ragout De Spencer, John F.T. Spencer.
7. Introduction to environmental Biotechnology, Milton Wainwright
8. Principles of Environmental Engineering, Gilbert Masters
9. Wastewater Engineering – Metcalf & Eddy.

CC13- BIOETHICS AND BIOSAFETY

UNIT I

(15 Periods)

Introduction to Indian patent law. World Trade Organization and its related intellectual Property provisions. Intellectual/Industrial property and its protection in research, design and development. Patenting in Biotechnology, Economic, Ethical and depositary consideration.

UNIT II

(20 Periods)

Entrepreneurship: selection of a product, line, design and development processes, economics on material and energy requirement, stock the product and release the same for making etc. the basic regulation of excise: demand for a given product, feasibility of its production under given constraints of raw material, energy input, financial situations export potential etc.

UNIT III

(10 Periods)

Bioethics- necessity of bioethics, different paradigms of Bioethics- National and International. Ethical issues against the Molecular technologies.

UNIT IV

(15 Periods)

Biosafety- Introduction to biosafety and health hazards concerning Biotechnology. Introduction to the concept of containment level and good Laboratory Practices(GLP) and Good Manufacturing Practices(GMP).

PRACTICALS

1. Proxy filling in Indian product patent.
2. Proxy filling in Indian processes patent.
3. Planning of establishing a hypothetical Biotechnology industry in India.
4. A case study on Clinical trials of drugs in India with emphasis on ethical issues.
5. Case study on women health ethics.
6. Case study on medical errors and negligence.
7. Case study on handling and disposal of radioactive waste.

SUGGESTED READING

1. Entrepreneurship: New venture Creation: David H. Holt.
2. Patterns of Entrepreneurship: Jack M Kaplan.
3. Entrepreneurship and small business Management: C.B. Gupta, S.S Khanka Sultan Chand & Sons.
4. Sateesh MK.(2010) Bioethics and Biosafety, I.K. International Pvt. Ltd.
5. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers.

CC14 – BIOPROCESS TECHNOLOGY

UNIT I

(10Periods)

Introduction to bioprocess technology. Range of bioprocess technology and its chronological development. Basic principle components of fermentation technology. Types of microbial culture and its growth kinetics – Batch, Fedbatch and continuous Culture.

UNIT II

(20 Periods)

Design of Bioprocess vessels – Significance, Impeller, Baffles, Sparger: Types of culture/Production vessels-Airlift: Cyclone Column: Packed Tower and their Application in production processes. Principles of upstream processing- Media Preparation, Inocula development and sterilization.

UNIT III

(15 Periods)

Introduction to oxygen requirement in bioprocess: mass transfer coefficient: factors affecting KLa. Bioprocess measurement and control system with reference to computer aided process control.

UNIT IV

(15 Periods)

Introduction to downstream processing, product recovery and purification. Effluent treatment. Microbial production of Ethanol, amylase, lactic acid and single Cell Proteins.

PRACTICALS

1. Bacterial growth curve.
2. Calculation of thermal death point (TDP) of a microbial sample.
3. Production and analysis of ethanol.
4. Production and analysis of amylase.
5. Production and analysis of lactic acid.
6. Isolation of industrially important microorganism from natural resource.

SUGGESTED READING

1. Casida LE.(1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.

2. Crueger W and Cruger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3. Patel AH. (1996). Industrial microbiology. 1st edition, Macmillan India Limited.
4. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.

DSE 3 PLANT DIVERSITY II

UNIT I: Pteridophytes

(10 periods)

General characters of pteridophytes, affinities with bryophytes & gymnosperms, classification, economic importance, study of life histories of fossil pteridophytes-

Rhynia

UNIT II: Pteridophytes: Types studies

(20 Periods)

Life histories of *Selaginella* – (heterospory and seed habit), *Equisetum*, *pteris*, *Lycopodium*.

UNIT III: Gymnosperms

(20 Periods)

General characters, classification, geological time scale, theories of fossils formation, types of fossils, fossil gymnosperms- *Williamsonia* & *Glossopteris*, telome and stele concept.

UNIT IV: Gymnosperms: Types studies

(10 periods)

Life histories of *Cycas* & *Pinus*, economic importance of Gymnosperms.

PRACTICALS

1. Examination of morphology and anatomy of vegetative and reproductive parts of *Selaginella*, *Equisetum* & *Pteris*.
2. Examination of morphology and anatomy of vegetative and reproductive parts of – *Cycus* and *Pinus*.
3. Plant collection (Pteridophytes and Gymnosperm).

SUGGESTED READING

1. Bhatnager, S.P. and Moitra, A. 1996 Gymnosperms. New age International(P) Ltd. Publishers, New Delhi.
2. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
3. Sambamurty 2008 A textbook of Bryophytes, Pteridophytes, Gymnosperm and paleobotany. IK International Publishers.

4. Wickens, G.E. 2004 Economic Botany: Principles and practices, Springer.
Kuwer Publishers, Dordrecht, The Netherlands.