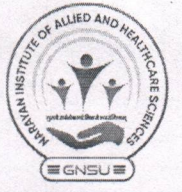




**Department of Medical Technology & Physician Studies**  
**Narayan Paramedical Institute & Allied Sciences**  
**Gopal Narayan Singh University, Jamuhar, Sasaram**



**Minutes of Meeting of Board of Studies (BOS)**

The meeting of Board of Studies (BOS) of Department of Medical Technology & Physician Studies, Faculty of Allied and Healthcare Sciences, Gopal Narayan Singh University, Jamuhar, Sasaram (Bihar) was held on February 25, 2026 at 10:00 AM, in the conference hall, Administration block, Gopal Narayan Singh University, Jamuhar, Sasaram (Bihar) 821305.

The following members were present:

- |                              |                                 |
|------------------------------|---------------------------------|
| 1. Prof. (Dr.) Neeraj Kumar  | Dean & Chairperson              |
| 2. Mr. Sudeep Kumar Singh    | COE & Member                    |
| 3. Dr. Rajat Kalra           | Member                          |
| 4. Ms. Harshita Sain         | External Expert (Joined Online) |
| 5. Mr. Ashwin Prakash Shedge | External Expert (Joined Online) |
| 6. Dr. Raj Kamal Vibhuti     | Member                          |
| 7. Mr. Sumit Singh           | Member                          |

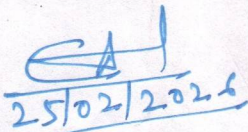
At the outset, the Dean, FAHS extended a warm welcome to all the members of BOS and conveyed best wishes for upcoming academic activities. After a detailed discussion, the members unanimously recommended the structure of the program, which includes the duration, number of credits, and the key components such as theory and practical courses. The members reviewed the syllabus and curriculum for the proposed program '**B.Sc. Cardiovascular Technology**'. Suggested changes were made to the content of certain courses to ensure that they align with the latest academic standards. After the discussion, it was resolved that the syllabus of the 'B.Sc. Cardiovascular Technology' program has approved for thirty seats and recommended for academic council.

The meeting ended with a vote of thanks to the Chair, External Expert and Members.

(Attended Virtual Mode)

**Ms. Harshita Sain**

Assistant Professor  
NIMS University, Jaipur

  
25/02/2026

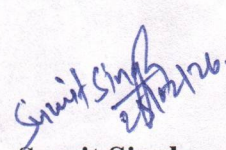
**Dr. Raj Kamal Vibhuti (Member)**

Assistant Professor  
NIAHS, GNSU, Jamuhar

(Attended Virtual Mode)

**Mr. Ashwin Prakash Shedge**

Assistant Professor  
Jaipur National University, Jaipur

  
25/02/2026

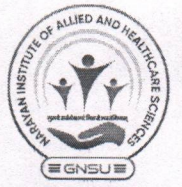
**Mr. Sumit Singh**

Assistant Professor  
NIAHS, GNSU, Jamuhar





**Department of Medical Technology & Physician Studies**  
**Narayan Paramedical Institute & Allied Sciences**  
**Gopal Narayan Singh University, Jamuhar, Sasaram**



*Singh*

**Sri Sudeep Singh (Member)**  
Academic Director & COE  
Gopal Narayan Singh University  
Jamuhar, Rohtas, Bihar

*Rajet*

**Prof. (Dr.) Rajat Kalra (Member)**  
Narayan Medical College & Hospital  
Gopal Narayan Singh University  
Jamuhar, Rohtas, Bihar

*Neeraj*  
*25/02/26*

**Prof. (Dr.) Neeraj Kumar (Chairman)**  
BPT, MSPT, PhD  
Dean

Faculty of Allied and Healthcare Sciences  
Gopal Narayan Singh University  
Jamuhar, Sasaram, Bihar-821305

**Gopal Narayan Singh University  
Jamuhar, Sasaram, Rohtas (Bihar)**

**Faculty of Allied & Healthcare Sciences**



**Ordinances and Syllabus Governing to  
4-Year/8-Semester (3 Year + 1 Year Internship)  
B.Sc. Cardiovascular Technology**

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Name of the Degree: B.Sc. Cardiovascular Technology

Duration of Study:

The duration of the study for the B.Sc. Cardiovascular Technology will be 4 years (3 years of academics + 1 year of Internship).

Eligibility Criteria:

- He/she has passed the Higher Secondary (10+2) with Science (PCB) or equivalent examination recognized by any Indian University or a duly constituted Board with pass marks in Physics, Chemistry, and Biology.
- Minimum percentage of marks: 45% aggregate.

Medium of Instruction:

English shall be the Medium of Instruction for all Subjects of study and for examinations.

1. Definitions of Key Words:

1.1. Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

1.2. Choice-Based Credit System (CBCS), the CBCS provides a choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

1.3. Course: Usually referred to as "papers", is a component of a Programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/ outreach activities/ project work/ viva/ seminars/ term papers/assignments/ presentations/self-study, etc. or a combination of some of these.

1.4. Credit: A unit by which the coursework is interpreted. It functions as the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

1.5. Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the sum total of the credit points obtained by the student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.

*Handwritten signatures and initials in blue ink:*  
Rajeev  
S. Singh  
S. Singh  
S. Singh  
S. Singh  
S. Singh

*Handwritten mark in blue ink:*  
JK

**1.6. Grade Point:** It is a numerical marking allotted to each letter grade on a 10-point scale.

**1.7. Letter Grade:** It is an appreciated point of the student's performance in a selected course. Grades are denoted by letters O, A+, A, B+, B and F.

**1.8. Semester Grade Point Average (SGPA):** It is index of performance of all performance of work in a semester. Its total credit points obtained by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

**1.9. Programme:** An educational programme leading to the award of a B. Sc Cardiovascular Technology.

**1.10. Semester:** Each Semester shall consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and the even semester from January to June. The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course contents and the hours of teaching.

**1.11. Semester Grade-Point Average (SGPA):** It is a measure of performance of the work done in a semester. It is the ratio of number of credit points secured by a student in various courses registered in a semester to the total number of course credits taken during that semester. It shall be expressed up to two decimal places.

**1.12. Transcript/ 'Grade- Card' or 'Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with the SGPA of that semester and the CGPA earned till that semester.

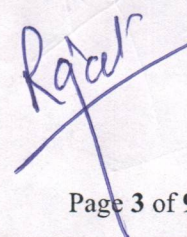
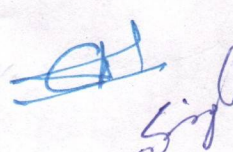
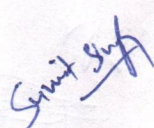
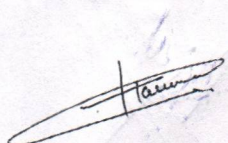
**1.13. University:** University means the Gopal Narayan Singh University, Jamuhar, Sasaram Bihar.

## **2. University Examination and Internal Assessment:**

The internal assessment and the End-Semester examination shall have the weightage of 30% and 70%, respectively.

### **2.1. Internal Assessment:**

**2.1.1.** Internal Assessment shall be done on a continuous basis, taking into account the student's class room performance, completion of assignments and performance at the two compulsory sessional tests to be conducted in a semester. For the sake of



uniformity, particularly for interdepartmental transfer of credits, all faculty members shall follow a uniform procedure of examination.

2.1.2. Internal Assessment Examination-I

2.1.3. Internal Assessment Examination-II

2.1.4. For conducting the Internal Assessment, one or more assessment tools, such as written tests, assignments, oral quizzes, paper presentation, laboratory work, etc., suitable to the course may be employed.

2.1.5. The Internal Assessment for theory shall consist of the following components with marks indicated against each:

I. Attendance: 5 marks

Attendance	5 marks
Below 10%	Nil
10% to <20%	1.0 mark
20 % to <30%	1.5 marks
30% to <40%	2.0 marks
40% to <50%	2.5 marks
50% to <60%	3.0 marks
60% to <70%	3.5 marks
70% to <80%	4.0 marks
80% to <90%	4.5 marks
90% to <100%	5.0 marks

II. Assignments/Presentations and Class Participation: 5 marks

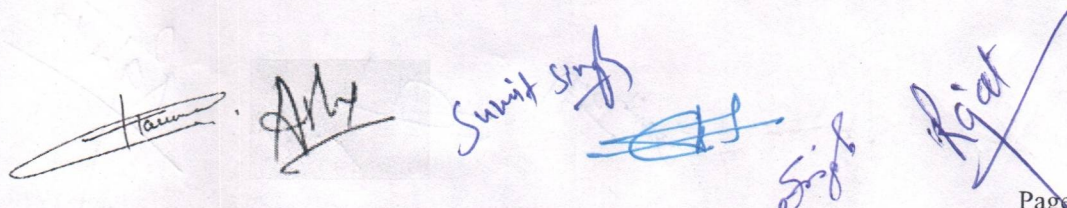
III. Internal Assessment Examination-I: 20 marks

IV. Internal Assessment Examination-II: 20 marks

**Note: Best of two internal assessment is considered for final marks.**

The criteria shall be made known to the students at the commencement of each semester.

For practical examination, 70 percent of the marks shall be awarded through an end-semester practical examination and remaining 30 percent of the marks shall consist of internal assessment to be awarded by the concerned faculty member (s) of the Department concerned.



Maximum 5 marks to be awarded for attendance of students (same as mentioned in case of internal assessment for theory examination).

Simplification of above statements regarding internal and external examination pattern as mentioned below:

**Duration of examinations:**

Internal	External
1.0 Hour	3.0 Hours

**Marks Distribution for Assessments:**

Type of Exam	Internal	External	Total
Theory	30	70	100
Practical	30	70	100

**Internal assessment (Theory Paper):**

Internal Examination-I	Internal Examination-II	Attendance	Assignments / Presentation	Total
20	20	5	5	30

Note: Best one internal mark is considered

**External Assessment (Theory Paper):**

Objectives	Short Answer	Long Answer	Total
$1 \times 10 = 10$	$6 \times 5 = 30$	$3 \times 10 = 30$	70

**Internal assessment (Practical Paper):**

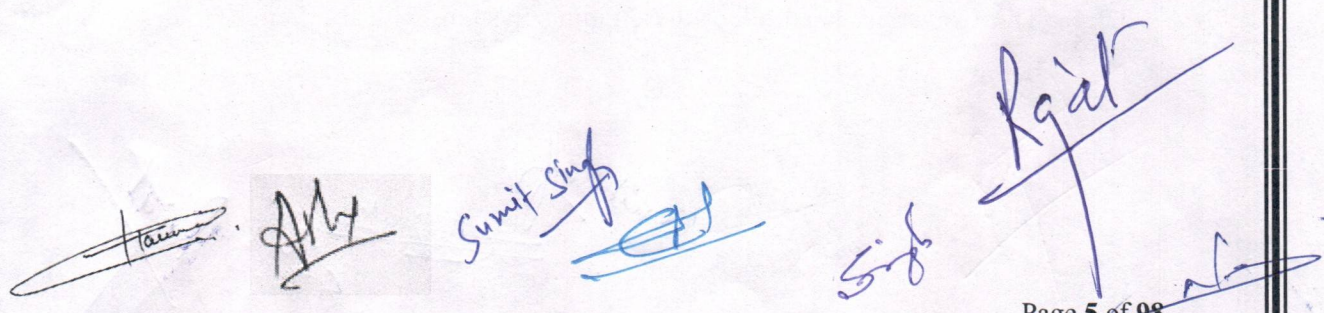
Class Test-I	Class Test-II	Attendance	Practical Records	Total
20	20	5	5	30

Note: Best one internal mark is considered

**External Assessment (Practical Paper): 70 Marks**

Spotting	Experiments	Practical Record	Viva Voce	Total
10	30	10	20	70

2.1.6. The Head/In-charge of the Department may allow a student to repeat one sessional test, if his/her application in this regard is considered as genuine on valid reasons.



## **2.2. University End-Semester Examination:**

**2.2.1.** The End-semester Examinations covering the entire syllabus prescribed for the course and carrying 70% of weightage, shall be conducted by the Examination Branch of the University, in consultation with the Head of the Institute/Department.

**2.2.2.** The Examiners or Board of Examiners shall be appointed for each course by the Controller of Examination (COE) on recommendation of Dean/Director/Board of Studies of the Department concerned.

**2.2.3.** The distribution of weightage for the valuation of semester-long project work/ internship shall be as follows:

Log Book/ Project Report: 30%

Presentation & Viva voce: 50%

Consistency in Attendance & Behavior: 20%

Or

as decided by the Board of Studies of the Department concerned in accordance with the guidelines issued by the regulatory bodies, if any.

**2.2.4.** The hall ticket/admit card shall be issued to the student on the recommendation of the Head of the Institute/Department, subject to the following conditions:

- I. Fulfilling the requirement of attendance as prescribed, and,
- II. Submission of a "No dues" certificate in the prescribed form.

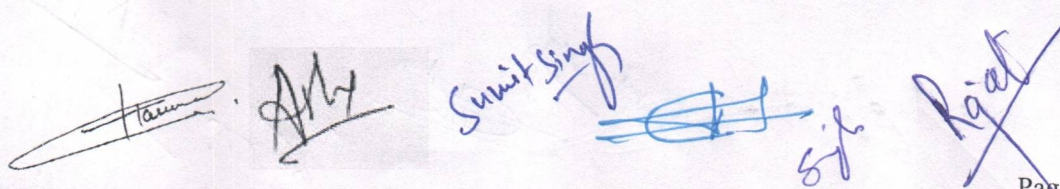
**2.3. Letter Grades and Grade-Points:** An absolute grading system shall be adopted to grade the students.

**2.3.1.** Under the absolute grading system, marks shall be converted to grades based on pre-determined class intervals.

**2.3.2.** In the End-semester theory or practical examinations, the examiner shall award the marks and those marks shall be further converted into Grades/Grade points by the examination branch in accordance with the provisions of this Ordinance.

**2.3.3.** The detailed Marks Sheet issued at the end of the semester or the programme shall carry marks/percentage and equivalent grades both.

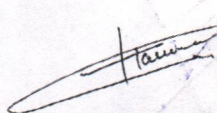

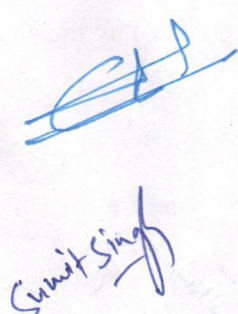
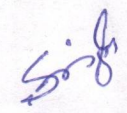


**2.3.4.** The University shall adopt the Grading System, with the Letter-Grades as specified below:



The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.

Marks obtained have also to be mentioned in their mark sheet and a weighted average of marks based on marks obtained in all the semesters taken together for the benefit of students.

Marks Obtained (Out of 100)	Letter Grade	Grade Point (SGPA/CGPA)	Range of Grade Point (SGPA/CGPA)
90 - 100	<b>O</b> (outstanding)	10	9.0 - 10
80 - 89.99	<b>A+</b> (Excellent)	9	8.0 - 8.9
70 - 79.99	<b>A</b> (Very good)	8	7.0 - 7.9
60 - 69.99	<b>B+</b> (Good)	7	6.0 - 6.9
50 - 59.99	<b>B</b> (Pass/Average)	6	5.0 - 5.9
50	<b>C</b> (In case of Grace)	5	5.0
Less than 50	<b>F</b> (Fail)	0	0
	<b>Ab</b> (Absent)	0	0

## 2.4. Setting of Question Papers and Evaluation:

2.4.1. The question papers for the End-Semester theory examinations for the first and second semesters shall be set and evaluated by internal faculty members who are teaching that particular course. However, for the End-Semester theory examinations for the third to eight semesters of BMLS papers shall be set and evaluation of answer books shall be done by the examiners (Internal as well as External ordinarily in the ratio of 50:50) out of the Panel of Examiners recommended by the Dean/Director/Board of Studies of the Department concerned on the basis of their expertise/ specialization.

Designing of question paper should take into consideration all levels of knowledge domain e.g.

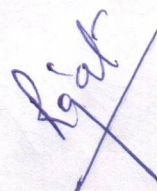

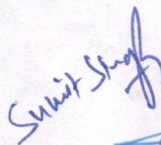
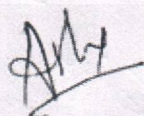
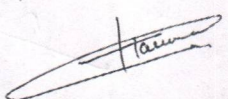
Bloom's taxonomy of cognitive domain. Use appropriate verbs for the questions at each level to assess higher levels of learning and applied knowledge of the subject.

2.4.2. Moderation of Question Papers: In the case of unavailability of external examiners, the Vice- Chancellor may allow the setting and evaluation to be done by the internal examiners only.

2.4.3. The question papers shall be moderated by a Board of Moderators to be appointed by the Controller of Examinations out of the panel drawn by Head/In- charge of the concerned department. The Assistant Professor, having five years of teaching experience, may also be included in the panel of moderators.

2.4.4. In the case of the practical examination of the courses, the assessment shall be jointly undertaken by the internal and external examiners. For the assessment of practical component, half of the examiners in the team shall be invited from outside the University from amongst the panel of examiners (ordinarily not below the rank of Assistant Professor with two-year experience) approved by the competent authority.

2.4.5. In case of the Project reports, and Internship, the assessment shall be jointly carried out by the internal and external examiners. External examiners shall be invited from amongst the panel of examiners (ordinarily not below the rank of Assistant Professor with three-year experience) approved by the competent authority.



**2.5. Pattern of Question Papers in End-Semester Examinations:  
Questions pattern for external examination practical**

Q.1. Spotting /OSCE/OSPE Based	10 Marks
Q.2. Experiment 1	15 Marks
Q.3. Experiment 2	15 Marks
Q.4. Practical Record Notebook	10 Marks
Q.5. Viva-Voce	20 Marks

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**Total: 70 Marks**

**2.6. Questions & Answers Pattern for External Examination theory**

**Time: 3 Hrs.**

**Maximum Marks: 70**

**Section A: Compulsory (Multiple choice type)**

**Q. 1. to 10.** All are compulsory 10 × 1 = 10 Marks

Ten Questions covering the entire syllabus

**Section B: Short answer type**

**Q. 1 to 8.** Attempt 6 out of 8 Short answer type

Eight Questions covering the entire syllabus 6 × 5 = 30 Marks

**Note: Answer the questions in about 100 words only.**

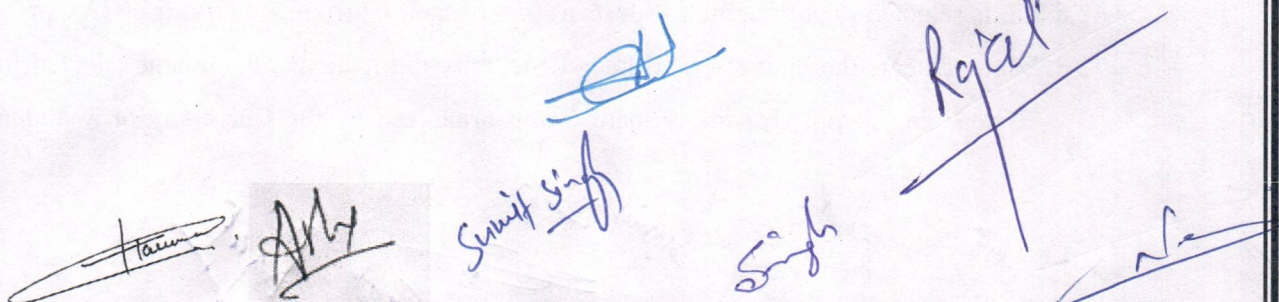
**Section C: Long (Descriptive Essay) answer type**

**Q. 1 to 5.** Attempt 3 out of 5 Long answer type

Five Questions covering the entire syllabus 3 × 10 = 30 Marks

**Note: Answer the questions in about 250 words only.**

-----  
**Total: 70 Marks**



## 2.7. Re-appear Examination:

The students failing to score minimum grade required to qualify a course/programme may be allowed to re-appear in those papers where they could not score 'B' grade in the end semesters examinations with next batch.

If a student secures "F" Grade in a Project Work/Project Report/Dissertation/Field Work Report/Training Report, he/she shall be required to resubmit the revised Project Work / Project Report/Dissertation/Field Work Report /Training Report etc. as required by the evaluator(s). Provided further that a student shall be permitted to re-submit the Project Report/Dissertation/Field Work Report/Training Report for a maximum of three times (excluding the first submission). Such students may avail the chance to re-appear only within the span period of the programme.

The Re-appear examination of even semesters shall be conducted with the end- semester examinations of even semesters and similarly examinations of odd semesters shall be conducted, with the end-semester examinations of the odd semesters. However, a student in the second last and last or final semester is allowed to re-appear in their supplementary examination. Supplementary examinations of second last and last semester will be conducted with thirty days of publication of result.

A 'Re-appear' examination shall be based on the syllabi of the course/programme in force at the time of initial registration to the course/programme.

## 2.8. Attendance:

**2.8.1.** A student of B.Sc. Cardiovascular Technology Programme will not be eligible to appear in any examination of any semester unless he/she has attended, in all subjects, 75% of the lectures/presentations and practicals separately, delivered in the University for the course of study in each semester.

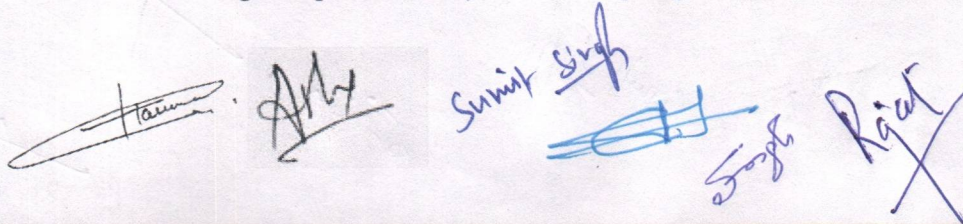
**2.8.2.** In case a student who

**2.8.2.1.** is selected as a member of the N.C.C. to participate in the annual N.C.C. Camps or is deputed to undertake Civil Defense work and allied duties; or

**2.8.2.2.** is enrolled in the National Service Scheme and is deputed to various public assignments by or with the approval of the Head of the Department concerned; or

**2.8.2.3.** is selected to participate in sports as part of their Curricular Activities (CA); or

**2.8.2.4.** represents the University in Inter-University tournaments, or student selected for coaching camp, University team Camp organized by the University or a student

The bottom of the page contains several handwritten signatures in blue ink. From left to right, there is a signature that appears to be 'Hanna', followed by 'Aly', 'Sumit Singh', a signature that looks like 'Sugh', and finally 'Rajat'.

who represents Bihar state in National tournaments organized by National Sports Federations, or a student who represents the University in tournaments organized by Association of Indian Universities, or a student who represents India in International Tournaments organized by International Federations/ Associations and FISU (selection through AIU) or a student who represents India in Olympics/Commonwealth Games/Youth Games/ World Championships/ organized by International Olympic Committee, or in national or international fixtures in games and sports approved by the Competent Authority; or

**2.8.2.5.** is required to represent the University at the Inter-University Youth Festival; or

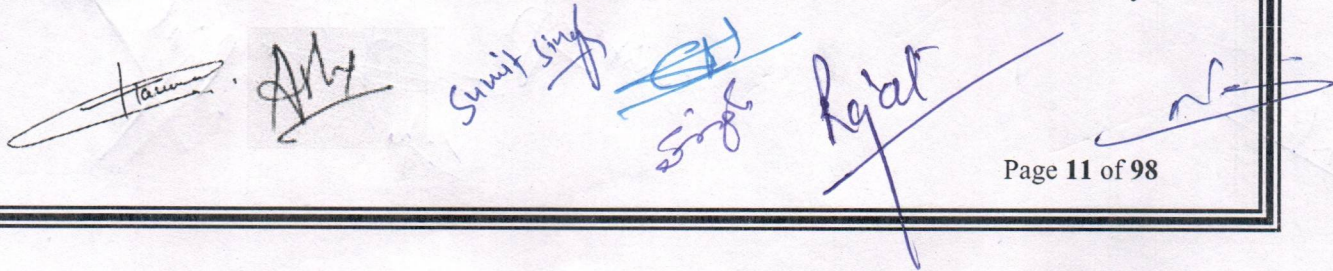
**2.8.2.6.** is required to participate in periodical training in the Territorial Army or a student who is deputed by the University to take part in Inter-University sports or fixtures, debates, seminars, symposia or social work projects or a student who is required to participate in curricular activities held in other Universities or such other activities held in other Universities approved by the Head for this purpose.

On calculating the total number of lectures etc. delivered in the University for his/her course of study in each Semester, the number of lectures etc., delivered in each subject, during the period of absence and as approved by the Head for the above purpose, shall be deemed to have been deducted from total number of conducted classes.

**2.8.3.** The Head of the Institute/Department may consider, on the basis of the Medical Certificates produced, exceptionally hard cases of students who had fallen seriously ill or had met with an accident during the year disabling them from attending classes for a certain period, with a view to determining whether the lectures etc. delivered during the said period, or a part thereof, could be excluded for purposes of calculation of attendance of the year and decide each case on its own merits.

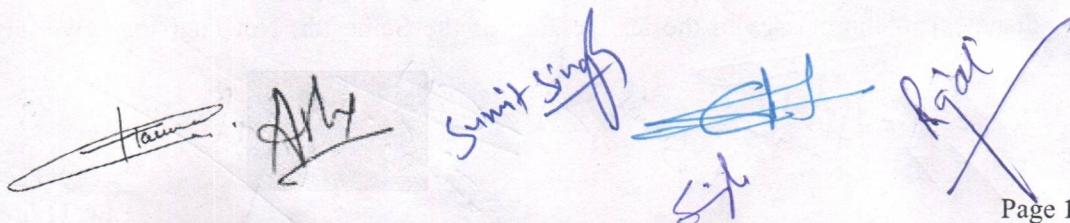
**2.8.4.** The Institute/Departments shall be required to notify the attendance position of each of their students for each month on the notice board and the website of the University, and clearly indicate the lectures/ practical/ presentation/ tutorials held subject-wise and the numbers attended by each student.

**2.8.5.** The Institute/Department shall notify on the notice board and the website of the University, the final attendance position of each of its students within five days of the dispersal of the classes in the last session of the Semester. Not later than five days

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thereafter, a student may, by an application to the Head, claim benefit of exclusion of lectures under sub-clause (iii) above on grounds to be specified and accompanied by the relevant documents. All such applications submitted within time shall be considered and disposed of by the Head of the Institute/Department at least 3 days prior to the commencement of the examination in which the student is intending to appear.

- 2.8.6.** The benefit of exclusion of lectures contemplated in para (iii) above shall, in no case, exceed 1/3 of the total number of lectures/practicals/presentation/ tutorials delivered.
- 2.8.7.** In case of a married woman student who is granted maternity leave, in calculating the total number of lectures delivered in the University for her course of study in each semester, in the number of lectures in each subject delivered during the period of her maternity leave shall not be taken into account or as per UGC/NCAHP norms.
- 2.8.8.** No person shall be deemed to have satisfied the required conditions in respect of his/her instructions, unless in addition to the requirements regarding attendance and other conditions, he/she has appeared and satisfied by his/her performance the Head of the Institute/ Department in such tests, written and/or oral, as may be held by him/her in his/her discretion. The Head of the Institute/Department shall have, and shall be deemed always to have had, the power to detain a student in the same class in which he/she has been studying, or not to send him/her in the same class in which he has been studying, or not to send him/her for the University Examination, in case he did not appear at the tests aforesaid or his performance was not satisfactory. The Head of the Institute/Department shall have power to strike off the name of a student who is grossly irregular in attendance in spite of warning, or when the absence of the student is for such a long period that he/she cannot put in requisite percentage of attendance.

A series of handwritten signatures in blue ink, including the name 'Smit Singh' and other illegible signatures.

### 3. Computation of SGPA and CGPA

The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses (Subjects) taken by a student and the sum of the number of credits of all the courses (Subjects) undergone by a student, i.e.

$$\text{SGPA (Si)} = \frac{\sum(Ci \times Gi)}{\sum Ci}$$

Where,

Ci is the number of credits of the i<sup>th</sup> course and Gi is the grade point scored by the student in the i<sup>th</sup> course.

#### 3.1. Computation of SGPA

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit × Grade)
I	Course-1	4	A	8	4 × 8 = 32
I	Course-2	4	B+	7	4 × 7 = 28
I	Course-3	4	B	6	4 × 6 = 24
I	Course-4	4	O	10	4 × 10 = 40
I	Course-5	2	C	5	2 × 5 = 10
I	Course-6	2	B	6	2 × 6 = 12
I	Course-7	2	O	10	2 × 10 = 32
I	Course-8	2	B	6	2 × 6 = 12
<b>Total Credit</b>		<b>24</b>			<b>190</b>
<b>Semester Grade Point Average (SGPA)</b>					<b>190/24 = 7.91</b>

The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \frac{\sum(Ci \times Si)}{\sum Ci}$$

Where,

Si is the SGPA of the i<sup>th</sup> semester and Ci is the total number of credits in that semester.

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Page 13 of 98

### 3.2. Computation of CGPA

Semester	I	II	III	IV	V	VI	VII	VIII
Credit	26	24	24	24	24	24	24	26
SGPA	7.9	7.8	7.5	6.9	6.5	8.0	7.5	7.1

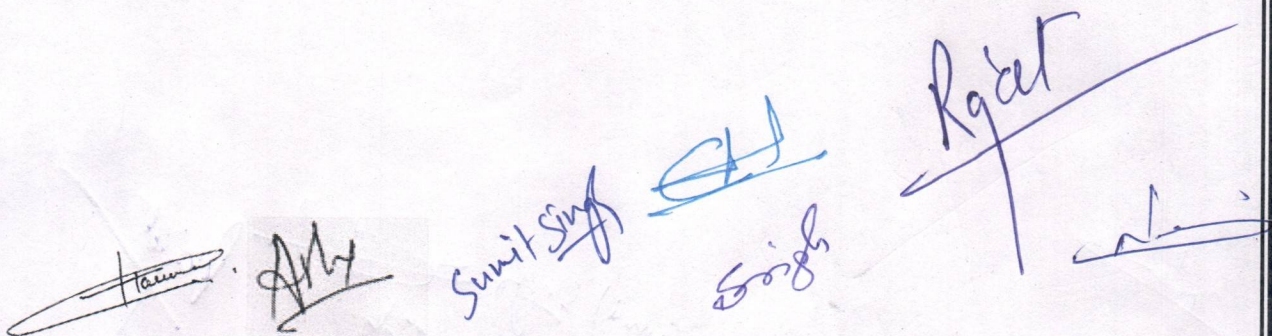
$$\text{CGPA} = \frac{\sum(C_i \times S_i)}{\sum C_i}$$
$$= \frac{24 \times 7.9 + 24 \times 7.8 + 24 \times 7.5 + 24 \times 6.9 + 24 \times 6.5 + 24 \times 8.0 + 24 \times 7.5 + 26 \times 7.1}{196}$$
$$= \frac{1435}{196} = 7.40$$

**Note:** Formula to calculate percentage from CGPA/SGPA = CGPA or SGPA  $\times$  10; and formula to calculate percentage to CGPA or SGPA = Percentage/10 e.g. In case of example mentioned in above table, the percentage of CGPA =  $7.39 \times 10 = 73.90$ .

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. Transcript (Format): Based on the above recommendations on Letter grades, grade points and SGPA and CCPA, the office of examination controller may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

**Transcript (Format):** Based on the above, letter grades, grade points, SGPA, and the CGPA, the Transcripts/Detail Marks Certificates (DMCs) shall be issued to the candidates for each semester and a consolidated transcript indicating the performance in all the semesters. The percentage of marks shall be reflected in the DMC of the final semester on the basis of the CGPA.

4. **Removal of Student Name from the Programme:** The name of a student falling under any one of the following categories shall be stand removed from the rolls of the University
- 4.1. A student who has failed to fulfil the minimum grade-point requirements prescribed for the programme during the span period of the programme.
  - 4.2. A student who has already exhausted the maximum duration allowed for completion of the Programme and has not fulfilled the requirements for the award of the degree / diploma.
  - 4.3. A student who is found to be involved in misconduct, forgery, indiscipline or any other objectionable conduct, upon recommendation of the Discipline Committee/ Proctorial Board; and
  - 4.4. A student who has failed to attend the classes as stipulated under relevant Ordinance.
5. **Eligibility for Promotion:** As per University/ Institute norm.
6. **Miscellaneous**
- 6.1. For any programme approved by the Academic Council, if a regulation is issued by the Academic Council, which is at variance with the provisions of this Ordinance, then the Ordinance shall prevail.
  - 6.2. Notwithstanding anything stated in this Ordinance, for any unforeseen issue arising, and not covered by this Ordinance, or in the event of any difference in interpretation, the Vice-Chancellor may take an appropriate decision.

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**Programme Outcome:**

1. **PO1. Knowledge:** Study and apply concepts, theories, and practices of health care system to gain fundamental knowledge.
2. **PO2. Analysis:** To identify, analyze and evaluate various experiences and perspectives using knowledge of paramedical & Allied Health sciences for substantiated conclusions.
3. **PO3. Development;** Individual or teamwork skills to support shared goals with the interdisciplinary healthcare team to improve societal health
4. **PO4. Tools & Techniques:** To create, select, and apply appropriate techniques, resources and modern tools with an understanding of the limitations in Health care system.
5. **PO5. Environment and Sustainability:** Understand the impact of Health care professionals in environmental contexts and demonstrate the knowledge for sustainable development.
6. **PO6. Ethics and Society:** Apply the ethical principles of health care practices for sustainable development of society
7. **PO7. Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, to manage projects and finance in multidisciplinary settings.
8. **PO8. Effective Communication:** Communicate effectively on Paramedical & allied Health care activities with the treating patient, community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
9. **PO9. Entrepreneurship:** Entrepreneur and leadership skills to practice independently as well as in collaboration with the interdisciplinary healthcare team.
10. **PO10. Life-long learning:** Adapt to the changes and advancements in technology and engage in independent and lifelong learning

**FIRST SEMESTER**

Course Code	Course Title	Credit		Marks Distribution				Total Marks
		Theory (T)	Practical (P)	Theory		Practical		
				IA	UE	IA	UE	
BCT 101	Human Anatomy Part 1	4	2	30	70	30	70	200
BCT 102	Human Physiology Part 1	4	2	30	70	30	70	200
BCT 103	General Biochemistry & Nutrition	4	2	30	70	30	70	200
BCT 104	National Health Care Delivery System	2	-	30	70	-	-	100
<b>Ability Enhancement Core Course</b>								
AEC101	Environmental Science	2	-	30	70	-	-	100
AEC102	Communication and Soft Skills	2	-	30	70	-	-	100
<b>Clinical Posting/ Education/ Duty</b>								
BCT105	Community & Clinical Orientation	-	2	-	-	-	-	-
<b>Total</b>		<b>18</b>	<b>8</b>	<b>180</b>	<b>420</b>	<b>90</b>	<b>210</b>	<b>900</b>
<b>Total Credits</b>		<b>26</b>						

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**SECOND SEMESTER**

Course Code	Course Title	Credit		Marks Distribution						Total Marks
		Theory (T)	Practical (P)	Theory		Practical		Total		
				IA	UE	IA	UE			
BCT 201	Human Anatomy Part II	4	2	30	70	30	70	200		
BCT 202	Human Physiology Part II	4	2	30	70	30	70	200		
BCT 203	General Microbiology	4	-	30	70	-	-	100		
BCT 204	Basic Pathology and Hematology	4	-	30	70	-	-	100		
BCT 205	Introduction to Quality and Patient Safety	2	-	30	70	-	-	100		
BCT 206	Practical for Microbiology, Pathology & Hematology	-	2	-	-	30	70	100		
<b>Skill Enhancement Elective Course</b>										
SEC 201	Medical Terminology & Record Keeping	2	-	30	70	-	-	100		
SEC 202	Medical Bioethics & IPR	2	-	30	70	-	-	100		
<b>Clinical Duty/ Clinical Exposure/ Duty</b>										
BCT 206	Community & Clinical Orientation	-	2	-	-	-	-	-		
<b>Total</b>		<b>20</b>	<b>8</b>	<b>180</b>	<b>420</b>	<b>90</b>	<b>210</b>	<b>900</b>		
<b>Total Credits</b>		<b>28</b>								

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**THIRD SEMESTER**

Course Code	Course Title	Credit		Marks Distribution						Total Marks
		Theory (T)	Practical (P)	Theory		Practical		UE		
				IA	UE	IA	UE			
BCT 301	Cardiac Pharmacology	4	-	30	70	-	-	-	-	100
BCT 302	Cardiovascular Anatomy & Physiology	4	2	30	70	30	70	30	70	200
BCT 303	Basics Electrocardiography	4	2	30	70	30	70	30	70	200
BCT 304	Basic Echocardiography	4	2	30	70	30	70	30	70	200
<b>Ability Enhancement Core Course</b>										
AEC 301	Professional Values & Human Rights	2	-	30	70	-	-	-	-	100
AEC 302	Medical Psychology	2	-	30	70	-	-	-	-	100
<b>Clinical Duty/ Clinical Exposure/ Duty</b>										
BCT 305	CT Directed Clinical Observation-I	-	2	-	-	-	-	-	-	-
	<b>Total</b>	<b>18</b>	<b>8</b>	<b>150</b>	<b>350</b>	<b>90</b>	<b>210</b>	<b>90</b>	<b>210</b>	<b>800</b>
	<b>Total Credits</b>	<b>26</b>								

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**FOURTH SEMESTER**

Course Code	Course Title	Credit		Marks Distribution						Total Marks
		Theory (T)	Practical (P)	Theory		Practical		Total		
				IA	UE	IA	UE			
BCT 401	Development of Cardiovascular System: Fetal & Neonatal	4	-	30	70	-	-	-	-	100
BCT 402	Cardiovascular Disease: Pertinent To Cardiovascular Technology	4	-	30	70	-	-	-	-	100
BCT 403	Cardiac Instrumentation	4	2	30	70	30	70	70	70	200
BCT 404	Cardiac Catheterization-I	4	2	30	70	30	70	70	70	200
<b>Ability Enhancement Elective Course</b>										
AEC 401	Computer and Applications	2	-	30	70	-	-	-	-	100
AEC 402	Principle of Managements	2	-	30	70	-	-	-	-	100
<b>Clinical Duty/ Clinical Exposure/ Duty</b>										
BCT 405	CT Directed Clinical Observation - II	-	4	-	-	-	-	-	-	-
	<b>Total</b>	<b>18</b>	<b>8</b>	<b>150</b>	<b>350</b>	<b>60</b>	<b>140</b>	<b>60</b>	<b>140</b>	<b>700</b>
	<b>Total Credits</b>	<b>26</b>								

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**FIFTH SEMESTER**

Course Code	Course Title	Credit		Marks Distribution						Total Marks
		Theory (T)	Practical (P)	Theory		Practical		Total		
				IA	UE	IA	UE			
BCT 501	Advance Electrocardiography	4	2	30	70	30	70	200		
BCT 502	Advance Echocardiography	4	2	30	70	30	70	200		
BCT 503	Invasive Cardiology	4	-	30	70	-	-	100		
BCT 504	Cardiac Catheterization-II	4	2	30	70	30	70	200		
<b>Skill Enhancement Elective Course</b>										
SEC 501	Basics of Clinical Skills Learning	2	-	30	70	-	-	100		
SEC 502	Hospital Operation Management	2	-	30	70	-	-	100		
<b>Clinical Duty/ Clinical Exposure/ Duty</b>										
BCT 505	PFT Directed Clinical Visit - I	-	2	-	-	-	-	-		
<b>Total</b>		<b>18</b>	<b>8</b>	<b>150</b>	<b>350</b>	<b>90</b>	<b>210</b>	<b>800</b>		
<b>Total Credits</b>		<b>26</b>								

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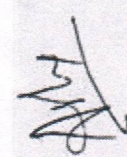
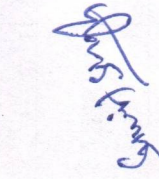


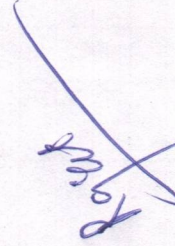

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**SIXTH SEMESTER**

Course Code	Course Title	Credit		Marks Distribution						Total Marks
		Theory (T)	Practical (P)	Theory		Practical				
				IA	UE	IA	UE			
BCT 601	Pediatric Interventions	4	2	30	70	30	70		200	
BCT 602	Emergency Medicine & Cardiac Life Support	4	2	30	70	30	70		200	
BCT 603	Advance Cardiac Care Technology	4	2	30	70	30	70		200	
<b>Ability Enhancement Elective Course</b>										
AEC 601	Research Methodology and Biostatistics	2	-	30	70	-	-		100	
AEC 602	AI in Healthcare	2	-	30	70	-	-		100	
<b>Clinical Duty/ Clinical Exposure/ Duty</b>										
BCT 604	CT Directed Clinical Visit - II	-	4	-	-	-	-		-	
	<b>Total</b>	<b>14</b>	<b>10</b>	<b>120</b>	<b>280</b>	<b>90</b>	<b>210</b>		<b>700</b>	
	<b>Total Credits</b>									<b>24</b>

**Eighth & Ninth Semester**

Course Code	Course Title	Duration
BCT 701	BCT Internship	1 Year

## FIRST SEMESTER

**Name of Course: Human Anatomy Part-1**

**Course Code: BCT 101**

**Course Objective:**

1. To introduce the students to the concepts related to General anatomy, Muscular, Respiratory, Circulatory, Digestive and Excretory system.

**Course Outcomes:**

1. Students able to Comprehend the normal disposition, interrelationships, gross, functional and applied anatomy of various structures in the human body.
2. Graduate able to demonstrate and understand the basic anatomy of Respiratory and Circulatory system.
3. Students able to demonstrate and understand the basic anatomy of Digestive and Excretory system

**Course Contents:**

**UNIT-1: Introduction**

Introduction to Anatomy, Terminology, Cell and Cell division, Tissues of body, Skin

**UNIT-2: Skeletal System & Joints**


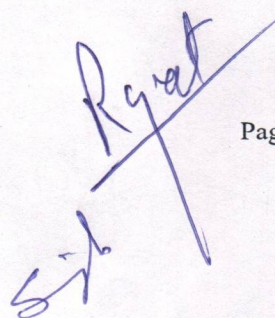
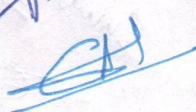
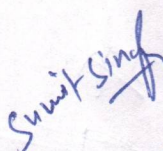
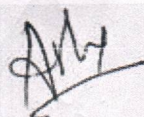
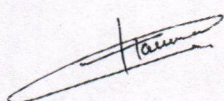
Classification of Bones, Parts of Developing Long Bone and Its Blood Supply, Joints I – Classification of Joints, Joints II – Synovial Joint, Appendicular Skeleton I – Bones of Upper Limb, Appendicular Skeleton II – Bones of Lower Limb, Axial Skeleton I – Bones of Head and Trunk, Axial Skeleton II – Vertebral Column and Thoracic Cage. Shoulder, Hip, Knee, Movements and muscle groups producing movements at other joints

**UNIT-3: Muscular System**

Muscle Types, Muscle Groups and Movements, Muscles of the Upper Limb, Muscles of the Lower Limb, Muscles of the Neck, Muscles of the Back, Muscles of the Abdomen.

**UNIT-4: Respiratory System**

Introduction to Respiratory system, Larynx, Thoracic cage and diaphragm, Lung & Pleura, Trachea & Bronchopulmonary segments, Mediastinum



### UNIT-5: Circulatory System

Types of blood vessels, Heart & Pericardium, Coronary Circulation, Overview of mediastinum, Blood vessels of Thorax

### UNIT-6: Digestive System & Excretory System

GIT I- Pharynx, Esophagus, GIT II-Stomach, GIT III- Small and Large Intestine, GIT IV-Liver & Gall Bladder, GIT V- Spleen, GIT VI-Pancreas, Salivary glands  
Kidney, Ureter, Bladder, Urethra, Pelvis dynamic

#### Text Books:

1. Manipal Manual of Anatomy for Allied Health Sciences courses: Madhyastha S.
2. G.J. Tortora & N.P. Anagnostakos: Principles of Anatomy and Physiology.
3. B.D. Chaurasia: Handbook of General Anatomy.

#### Reference books:

1. B.D. Chaurasia: Volume I-Upper limb & Thorax, Volume II- Lower limb, Abdomen & Pelvis. Volume III- Head, Neck, Face. Volume IV- Brain- Neuroanatomy.
2. Vishram Singh: Textbook of Anatomy Upper limb & Thorax
3. Textbook of Head neck and Brain.
4. Peter L. Williams And Roger Warwick:- Gray's Anatomy - Descriptive and Applied, 36th Ed; Churchill Livingstone.
5. T.S. Ranganathan: Text book of Human Anatomy.
6. Inderbir Singh, G P Pal: Human Embryology.
7. Textbook of Histology, A practical guide- J.P Gunasegaran.

**Name of Course: Human Physiology Part-1**  
**Course Code: BCT 102**

**Course Objective:**

1. To teach basic physiological concepts related to General physiology, Hematology, Nerve-Muscle physiology, Cardiovascular, Digestive & Respiratory physiology

**Course Outcomes:**

1. To understand the basic physiological concepts of General physiology
2. To understand the basic physiological concepts of Hematology
3. To understand the basic physiological concepts of Nerve-Muscle physiology
4. To understand the basic physiological concepts of Respiratory physiology
5. To understand the basic physiological concepts of Cardiovascular physiology

**Course Contents:**

**UNIT-1: General Physiology**

Introduction to physiology, Homeostasis, Transport Across cell membrane

**UNIT-2: Blood & Body Fluid**

Composition, properties and functions of Blood, Hemopoiesis, Hemogram (RBC, WBC, Platelet count, Hb Concentrations), Blood Groups - ABO and RH grouping, Coagulations & Anticoagulants, Anemias: Causes, effects & treatment, Body Fluid: Compartments, Composition, Immunity – Lymphoid tissue.

**UNIT-3: Cardiovascular System**

Introduction, general organization, functions & importance of CVS, Structure of heart, properties of cardiac muscle, Junctional tissues of heart & their functions, Origin & spread of Cardiac Impulse, cardiac pacemaker, Cardiac cycle & ECG, Heart Rate & its regulation, Cardiac output, Blood Pressure definition & normal values, Physiological needs & variation, regulation of BP

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#### **UNIT-4: Digestive system**

General Introduction, organization, innervations & blood supply of Digestive system, Composition and functions of all Digestive juices, Movements of Digestive System (Intestine), Digestion & Absorption of Carbohydrate, Proteins & Fats

#### **UNIT-5: Respiratory System**

Physiologic anatomy, functions of respiratory system, non-respiratory functions of lung, Mechanism of respiration, Lung Volumes & capacities, Transport of Respiratory Gases O<sub>2</sub>, Transport of Respiratory Gases CO<sub>2</sub>, Regulation of Respiration.

#### **UNIT-6: Muscle Nerve Physiology**

Structure of neuron & types, Structure of skeletal Muscle, sarcomere, Neuromuscular junction & Transmission. Excitation & contraction coupling (Mechanism of muscle contraction)

#### **List of Practical:**

1. Study of Microscope and its use, Collection of Blood and study of Haemocytometer
2. Hemoglobinometry
3. White Blood Cell count
4. Red Blood Cell count
5. Determination of Blood Groups
6. Leishman's staining and Differential WBC Count
7. Determination of Bleeding Time, Determination of Clotting Time
8. Pulse & Blood Pressure Recording, Auscultation for Heart Sounds
9. Artificial Respiration – Demonstration, Spirometry- Demonstration

#### **Textbooks**

1. Basics of medical Physiology – D Venkatesh and H.H Sudhakar, 3rd edition.
2. Principles of Physiology – Devasis Pramanik, 5th edition.
3. Human Physiology for BDS – Dr A.K. Jain, 5th edition.
4. Textbook of human Physiology for dental students – Indukhurana 2nd edition.
5. Essentials of medical Physiology for dental students – Sembulingum.

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A.W.  
Sumit Singh  
S.S.  
R.S.

**Reference books**

1. Textbook of Medical Physiology, Guyton, 2nd South Asia Edition.
2. Textbook of Physiology Volume I & II (for MBBS) – Dr. A. K. Jain.
3. Comprehensive textbook of Medical Physiology Volume I & II – Dr. G. K. Pal.

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**Name of Course: General Biochemistry & Nutrition**  
**Course Code: BCT 103**

**Course Objective:**

1. At the end of the course, the student demonstrates his knowledge and understanding of Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
2. Integration of the various aspects of metabolism, and their regulatory pathways.
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data to diagnose various nutritional deficiencies
4. Identify condition and plan for diet Provide health education base on the client deficiencies

**Course Outcomes:**

1. Identify the five classes of polymeric biomolecules and their monomeric building blocks.
2. Explain the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.
3. Explain how the metabolism of glucose leads ultimately to the generation of large quantities of ATP.
4. Describe how fats and amino acids are metabolized, and explain how they can be used for fuel.
5. Describe the structure of DNA, and explain how it carries genetic information in its base sequence.
6. Explain how protein synthesis can be controlled at the level of transcription and translation.

**Course Contents:**

**UNIT-1: Biomolecules**

Chemistry of carbohydrates, proteins, lipids and nucleic acid. **Chemistry of Carbohydrates:** Definition, Functions, Properties, Outline of classification with e.g. (Definition of Monosaccharides, Disaccharides, Polysaccharides and their examples). **Chemistry of Proteins:** Amino acids (total number of amino acids, essential and non-essential amino acids) Definition, Classification of Proteins Structural organization of protein, Denaturation of Proteins. **Chemistry of Lipids:** Definition, functions, Classification (Simple Lipids, Compound Lipids,

Sumit Singh

Derived Lipids.) Essential Fatty Acids. **Chemistry of Nucleic acid:** Nucleosides and Nucleotides, Watson and Crick model of DNA, RNA- it's type along with functions

### **UNIT-2: Enzymes**

Classification, mechanism of enzyme action, Factors affecting activity of enzymes, enzyme specificity, Enzyme inhibition, Isoenzymes and their diagnostic importance. Allosteric Enzymes, Ribozyme, Zymogen

### **UNIT-3: Metabolism**

**Metabolism of Carbohydrate:** Glycolysis, TCA cycle, Definition and significance of glycogenesis and glycogenolysis. HMP shunt, Gluconeogenesis. Regulation of blood Glucose level, Diabetes Mellitus, Glycosuria. Glucose Tolerance Test.

**Metabolism of Proteins:** Transamination, Transmethylation reactions. Urea cycle, Functions of glycine, tyrosine, phenylalanine, tryptophan and Sulphur containing amino acids.

**Metabolism of Lipid:** Outline of beta oxidation with energetic, Ketone bodies (Enumerate) and its importance. Functions of cholesterol and its biomedical significance. Lipid profile and its diagnostic importance. Fatty liver, lipotropic factor, atherosclerosis.

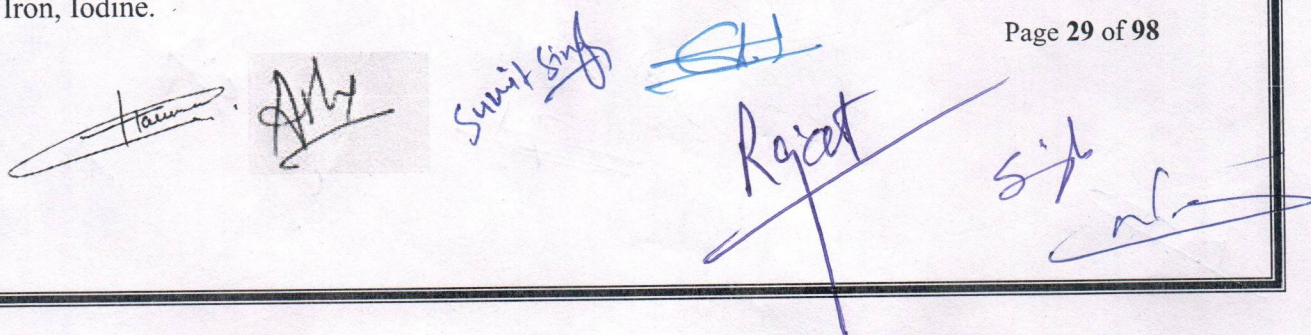
**Metabolism of Nucleic acid:** Purine catabolism (Formation of uric acid), Gout Disease  
Definition of Oxidative phosphorylation Electron transport chain. Inhibitors and Uncouplers briefly

### **UNIT-4: Nutrition**

History of Nutrition, Nutrition as a science, Food groups, RDA, Balanced diet, diet planning, Assessment of nutritional status. **Energy:** Units of energy, Measurements of energy and value of food, Energy expenditure, Total energy/calorie requirement for different age groups and diseases, Satiety value, Energy imbalance- obesity, starvation, Limitations of the daily food guide, Role of essential nutrients in the balanced diet

### **UNIT-5: Vitamins and Minerals**

Recommended Dietary Allowance (RDA), Sources, functions and deficiency manifestations of Fat-soluble vitamins. RDA & Functions and deficiency manifestations of Water-soluble vitamins. RDA, Sources, functions and deficiency manifestations of Calcium, Phosphorous, Iron, Iodine.

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**Practical:** Collection and preservation of samples (Anticoagulants), transportation & separation of biological specimens, Sample rejection criteria, Disposal of biological Waste materials

**List of Practical:**

1. Introduction to Personnel protective equipment used in laboratory and their importance (LCD)
2. Handling of colorimeters – operation and maintenance (LCD)
3. Serum electrolytes measurement (only demo)
4. Demonstration of semi-automated / fully automated blood analyzer
5. Demonstration of tests for carbohydrates (Monosaccharides, disaccharides and polysaccharides)
6. Precipitation Reactions of protein (only demonstration)
7. Test on bile salts (only demonstration)
8. Tests on Normal constituents of Urine (only demo)
9. Tests on Abnormal constituents of Urine (only demo)

**Textbooks:**

1. Textbook of Medical Laboratory Technology, Volume 1, 2; 3rd Edition by Praful Ghodkar.
2. Medical Laboratory Technology (Volume 1, 2, & 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee.

**Reference books:**

1. An Introduction to Chemistry, 8th Edition by Mark Bishop.
2. Clinical Chemistry made easy, 1st Edition by Hughes.
3. Tietz Fundamentals of Clinical Chemistry, 7th Edition by Carl Burtis.

**Name of Course: National Healthcare Delivery System**

**Course Code: BCT 104**

**Course Objectives:**

1. The course provides the students a basic insight into the main features of Indian health care delivery system
2. Familiarity with implementation of health care delivery processes in India.

**Course Outcomes:**

1. Student will have thorough **knowledge** of healthcare delivery system in India that will help to analyse the scenario.
2. Student will have **understood** about government policies and they implement in their working place.
3. Students will have ability to **differentiate** amongst the AYUSH System and how they work.
4. Students will have use **modern tools** for **explain** demographic situations of Health sciences in India.
5. Student will **analyze** the healthcare system with respect of Epidemiology.
6. Graduates will be able to **generate** daily log book for patients for better treatment and diagnosis.

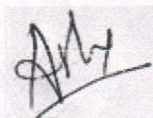
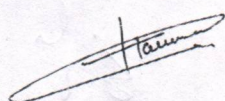
**Course Contents:**

**UNIT-1: Introduction**

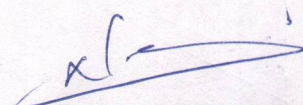
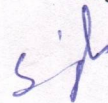
Healthcare delivery system in India at primary, secondary and tertiary care; Community participation in healthcare delivery system; Health system in developed countries; Private / Govt Sector; National Health Mission; National Health Policy; Issues in Health Care Delivery System in India

**UNIT-2: National Health Programme**

**Health scenario of India:** Past, Present and Future, **National Health Programme:** Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme. Health scenario of India- past, present and future.



Shruti Singh



### **UNIT-3: Introduction to AYUSH System of Medicine**

Introduction to Ayurveda; Yoga and Naturopathy; Unani; Siddha; Homeopathy; Need for integration of various system of medicine

### **UNIT-4: Demography & Vital Statistics**

Demography – its concept; Census & its impact on health policy

### **UNIT-4: Epidemiology**

Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-communicable diseases, disease, transmission, host defense immunizing agents, cold chain, immunization, disease, monitoring and surveillance.

#### **Textbooks:**

1. National Health Programs of India National Policies and Legislations Related to Health:  
1 J. Kishore (Author).
2. A Dictionary of Public Health Paperback by J Kishor.
3. Health System in India: Crisis & Alternatives , National Coordination Committee, Jan Swasthya Abhiyan.
4. In search In Search of the Perfect Health System.
5. Central Bureau of Health Intelligence (1998). Health Information of India, Ministry of Health and Family Welfare, New Delhi.
6. Goyal R. C. (1993). Handbook of Hospital Personal Management, Prentice Hall of India, New Delhi, 17–41. Ministry of Health and Family Welfare (1984). National Health Policy, Annual Report (1983–4), Government of India, New Delhi
7. Historical Development of Health Care in India, Dr. Syed Amin Tabish,
8. Cultural Competence in Health Care by Wen-Shing Tseng (Author), Jon Streltzer (Author)
9. Do We Care: India's Health System by K. Sujatha Rao (Author)

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**Name of Course: Environmental Science**

**Course Code: AEC 101**

**Course Objectives:**

1. The student will be made aware of the environment in general, natural resources, ecosystems, environmental pollution.
2. Students also learn social issues related to environment, human population and the environment and understanding the hospital environment.

**Course Outcomes:**

1. Students will have **knowledge** about natural resources of the earth and ecosystem.
2. Students will be able to **understand** how to manage environmental pollutions.
3. Student can **apply** their knowledge for protection of our environment.
4. Students will able to **analyze** consequences and effects of pollution in our environment.
5. Graduates will able to **evaluate** human intervention in the cause of different type of populations.
6. Students will able to **design** project that helps in controlling environmental pollutions.

**Course Contents:**

**UNIT-1: Introduction**

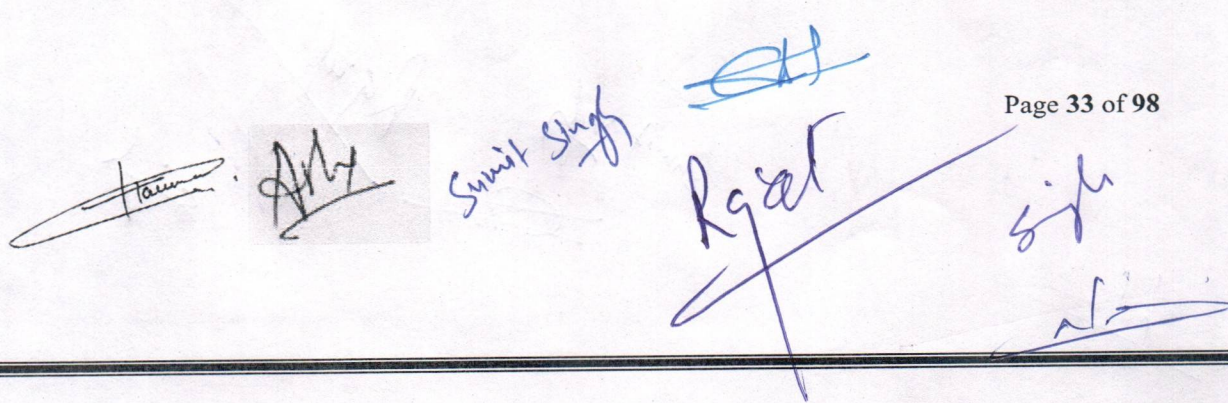
Components of Environment: Hydrosphere, lithosphere, atmosphere and biosphere. definitions with examples; Interaction of man and environment.

Ecosystem: Basic concepts, components of ecosystem, Tropic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological, Characteristics of terrestrial fresh water and marine ecosystems.

**UNIT-2: Global Environmental Problems**

Green House Effect, Acid rain, El Nino, Ozone depletion, deforestation, desertification, salination, biodiversity loss; chemical and radiation hazards.

Environmental pollution and degradation – Pollution of air, water and land with reference to their causes, nature of pollutions, impact and control strategies; perspectives of pollution in urban, industrial and rural areas. Habitat Pollution by Chlorinated Hydrocarbons (DDT, PCBs, Dioxin etc, Endocrine disrupting chemicals, Nutrient pollution.

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### **UNIT-3: Environmental Management**

Concept of health and sanitation, environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases, health hazards due to pesticide and metal pollution, waste treatment, solid waste management, environmental standards and quality monitoring.

### **UNIT-4:**

Environmental Protection Act – Environmental Laws, national movements, environmental ethics – holistic approach of environmental protection and conservation, IUCN – role in environmental protection. Concept with reference to UN – declaration, aim and objectives of human right policies with reference to India, recent north-south debate on the priorities of implementation, Environmental Protection Agency (EPA)

### **UNIT-5: Bioremediation**

Bioremediation – Oil spills, Wastewater treatment, chemical degradation, heavy Metals.

#### **Text books:**

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.

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#### **UNIT-4: Listening & Reading**

**Listening:** Importance of listening, Self-assessment, Action plan execution, Barriers in listening, Good and persuasive listening

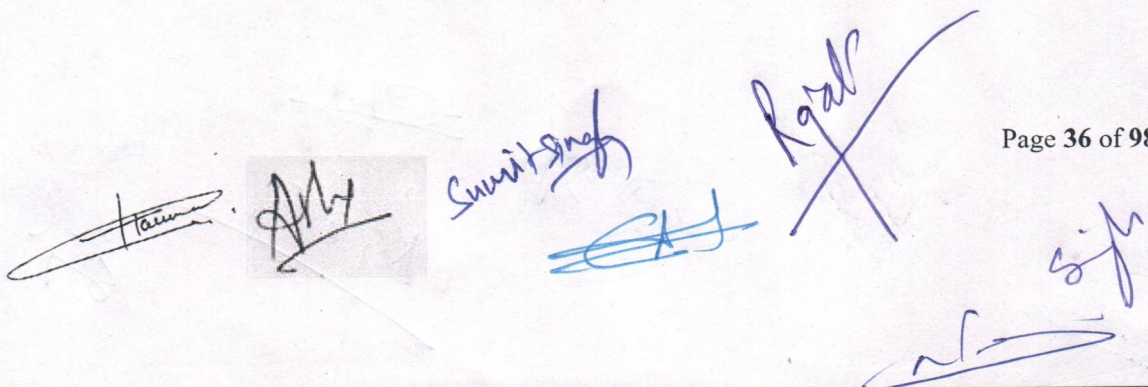
**Reading:** What is efficient and fast reading, Awareness of existing reading habits, tested techniques for improving speed, Improving concentration and comprehension through systematic study

#### **UNIT-5: Non-Verbal Communication**

Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP), Communication in Optometry practice

#### **Text books:**

1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers. Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications, USA, 2009.

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**Course Title / Subject Names: Communication and Soft Skills**  
**Course Code / Subject Code : AEC 102**

**Course Objectives:**

1. The students will be able communicate in English through speaking or writing.
2. This course trained students to draft letters and application regarding official work.

**Course Outcomes:**

1. Students will have good **knowledge** about English grammar and drafting letters.
2. Students will have able to **understand** how to proper arrange of words in sentences.
3. Student will able to **respond frequently** asked questions develop leadership skill that help in laboratory managements.
4. Students will able to **explain** answers and write formal or informal letter.
5. Students will able to select appropriate word or sentences during answer writing and letter drafting.
6. Students will able to **design and assemble** official application and letters.

**Course Content:**

**UNIT-1: Basics of Grammar**

Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words, Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms

**UNIT-2: Writing Skills**

Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension Writing and Reading, Summary writing, Creative writing, newspaper reading Practical Exercise, Formal speech, Phonetics, semantics and pronunciation

**UNIT-3: Communication Skills**

Communication process, Elements of communication, Barriers of communication and how to overcome them, Nuances for communicating with patients and their attenders in hospitals Speaking - Importance of speaking efficiently, Voice culture, Preparation of speech. Secrets of good delivery, Audience psychology, handling Presentation skills, Individual feedback for each student, Conference/Interview technique

Sumit Singh

### List of Practical

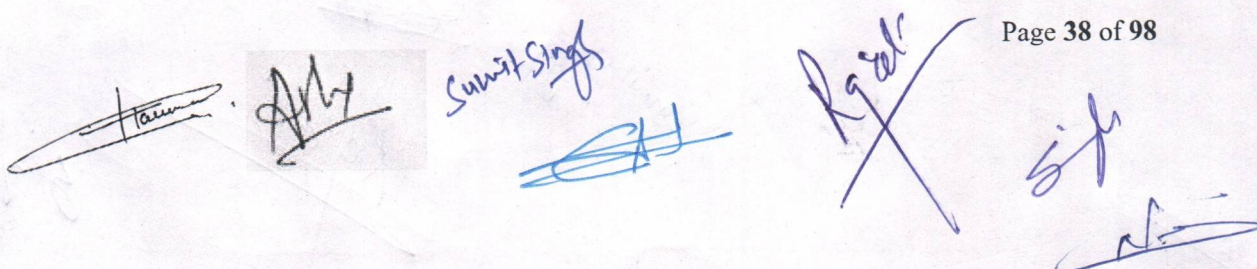
1. Reproductive system - Male- Testis, Spermatic Cord, Female- Ovaries & Fallopian tube, Uterus
2. Lymphatic system - Lymphoid Organs, Lymph node groups- Cervical, Axillary, Inguinal
3. Endocrine system - Thyroid, Parathyroid, Adrenal, Pituitary
4. Nervous system - Introduction to nervous system(Neuron, ANS, PNS)
5. Meninges, Cerebrum I, Cerebrum II, Cerebellum, Blood supply of Brain ,Brain stem, Spinal cord, Cranial and peripheral nerves, CSF & Ventricles
6. Sensory system - Eye (Gross anatomy), Ear

### Textbooks:

1. Manipal Manual of Anatomy for Allied Health Sciences courses: Madhyastha S.
2. G.J. Tortora& N.P Anagnos Akos: Principles of Anatomy and Physiology.
3. B.D. Chaurasia: Handbook of General Anatomy.

### Reference books:

1. B.D. Chaurasia: Volume I, II, III & IV
2. Vishram Singh: Textbook of Anatomy Upper limb & Thorax
3. Textbook of Anatomy Abdomen & Lower limb
4. Textbook of Head neck and Brain
5. Peter L. Williams And Roger Warwick:- Gray's Anatomy - Descriptive and Applied, 36th Ed; Churchill Livingstone.
6. T.S. Ranganathan: Text book of Human Anatomy.
7. Inderbirsingh, G P Pal: Human Embryology.
8. Textbook of Histology, A practical guide: - J.P Gunasegaran.

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## SECOND SEMESTER

**Course Title / Subject Names: Human Anatomy Part-II**

**Course Code / Subject Code : BCT 201**

### **Course Objectives:**

1. To teach the students the basic anatomy of Reproductive, Lymphatic Endocrine, Nervous system and Special senses

### **Course Outcomes:**

1. Demonstrate and understand the basic anatomy of Reproductive and Lymphatic system.
2. Demonstrate and understand the basic anatomy of Endocrine, Nervous system
3. Demonstrate and understand the basic anatomy of Special senses

### **Course Content:**

#### **UNIT-1: Reproductive system**

Male- Testis, Spermatic Cord, Female- Ovaries & Fallopian tube, Uterus

#### **UNIT-2: Lymphatic system**

Lymphoid Organs, Lymph node groups- Cervical, Axillary, Inguinal

#### **UNIT-3: Endocrine System**

Thyroid, Parathyroid, Adrenal, Pituitary

#### **UNIT-4: Nervous system**

Introduction to nervous system (Neuron, ANS, PNS) Meninges, Cerebrum I, Cerebrum II, Cerebellum, Blood supply of Brain, Brain stem, Spinal cord, Cranial and peripheral nerves, CSF & Ventricles

#### **UNIT-5: Sensory system**

Details structure of Eye (Gross anatomy), Ear, Skin

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Ovulation, Estrogen & Progesterone, Pregnancy test, Parturition. Contraceptives, Lactation: Composition of Milk, advantages of breast Feeding.

#### **UNIT-5: Excretory System**

General Introduction, structure & functions of kidney, Renal circulation, Glomerular filtration & tubular reabsorption, Nephron, Juxta Glomerular Apparatus, Mechanism of Urine formation, Micturition, Cystometrogram. Diuretics, Artificial Kidney.

#### **List of Practical:**

1. Recording of body temperature
2. Examination of sensory system
3. Examination of motor system
4. Examination of Eye
5. Examination of ear

#### **Textbooks:**

1. Manipal Manual of Anatomy for Allied Health Sciences courses:Madhyastha S.
2. G.J. Tortora& N.P Anagnostakos: Principles of Anatomy and Physiology.
3. B.D. Chaurasia: Handbook of General Anatomy.

#### **Reference books:**

1. B.D. Chaurasia: Volume I, II, III, & IV -Upper limb & Thorax, Lower limb, Abdomen & Pelvis, Head, Neck, Face, Brain-Neuroanatomy
2. Vishram Singh: Textbook of Anatomy Upper limb & Thorax
3. Peter L. Williams and Roger Warwick:- Gray's Anatomy - Descriptive and Applied, 36th Ed; Churchill Livingstone.
4. T.S. Ranganathan : Text book of Human Anatomy.
5. Inderbir Singh, G P Pal: Human Embryology.
6. Textbook of Histology, A practical guide: - J.P Gunasegaran.

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**Course Title / Subject Names: Human Physiology Part-II**  
**Course Code / Subject Code: BCT 202**

**Course Objectives:**

1. To teach basic physiological concepts related to Renal physiology, Endocrinology & Reproductive physiology, CNS, Special senses.

**Course Outcomes:**

1. To understand the basic physiological concepts of Renal physiology
2. To understand the basic physiological concepts of Endocrinology & Reproductive physiology
3. To understand the basic physiological concepts of CNS, Special senses

**Course Content:**

**UNIT-1: Nervous system**

Functions of Nervous system, Neuron – Conduction of Impulses, factors affecting, Synapse-transmission, Receptors, Reflexes Ascending tracts, Descending tracts, Functions of various parts of the Brain. Cerebro-Spinal Fluid (CSF): Composition, functions & Circulation, Lumbar Puncture, Autonomic Nervous System (ANS): Functions.

**UNIT-2: Special Senses**

Vision: Structure of Eye, functions of different parts, Refractive errors of Eye and correction, Visual Pathway, Colour vision & tests for colour Blindness, Hearing: Structure and function of ear, Mechanism of Hearing, Tests for Hearing (Deafness). Skin - Structure and function, Body temperature, Regulation of Temperature & fever.

**UNIT-3: Endocrine System**

Short description of various endocrine glands and their functions. Hypothalamus & Pituitary Glands. Thyroid, Parathyroid, Adrenal & Pancreases. Mechanism of Hormone Action, Regulation & Disorders

**UNIT-4: Reproductive Systems**

Structure & Functions of Reproductive system, Male Reproductive System: spermatogenesis, Testosterone, Female reproductive system: Ovulation, Menstrual cycle, Oogenesis, Tests for

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**Course Title / Subject Names: General Microbiology**  
**Course Code / Subject Code: BCT 203**

**Course Objectives:**

1. To introduce basic principles and then applies clinical relevance in four segments of the academic preparation for paramedical: immunology, bacteriology, mycology, and virology. This rigorous course includes many etiological agents responsible for global infectious diseases.

**Course Outcomes:**

1. Upon completion, students should be able to demonstrate knowledge of microorganisms and the disease process as well as aseptic and sterile techniques.
2. Perform microbiological laboratory procedures according to appropriate safety standards.

**Course Contents:**

**UNIT-1: Concepts and Principles of Microbiology**

Historical Perspective, Koch's Postulates, Importance of Microbiology, Microscopy, Classification of Microbes. General Characters of Microbes - Morphology, staining methods, Bacterial growth & nutrition, Culture media and culture methods +ABS, Collection of specimen, transport and processing, antimicrobial mechanism and action, Drug Resistance minimization.

**UNIT-2: Control of Microbial Growth**

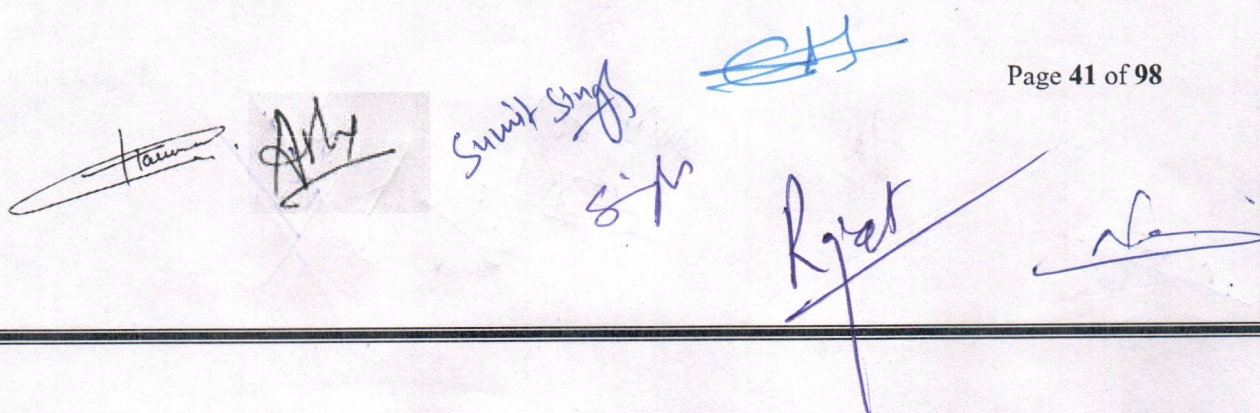
**Sterilization and Disinfection:** Concept of sterilization, Disinfection aseptis, Physical methods of Sterilization, Chemical methods (Disinfection), OT Sterilization, Biological waste and Biosafety & Biohazard. **Infection and Infection Control:** Infection, Sources, portal of entry and exit, Standard (Universal) safety Precautions & hand hygiene, Hospital acquired infections & Hospital Infection Control

**UNIT-3: Immunology**

Cells & Organ of Immune System, Immunity, Types Classification, Antigen, Antibody: Definition and types, Ag-Ab reactions: Types and examples, ELISA, Vaccine: Types of vaccines & Principle, Immunization Schedule.

**UNIT-4: Systemic Bacteriology**

Morphology, diseases caused, specimen collection & lists of laboratory tests. Introduction, Gram Positive Cocci & Gram-Negative Cocci, Enterobacteriaceae & Gram-negative bacilli,

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Mycobacteria, Anaerobic bacteria & Spirochaetes, Zoonotic diseases, Common Bacterial infections of eye.

**UNIT-5: Mycology**

Introduction, Classification, outline of lab diagnosis, List of Fungi causing: Common fungal infections of eyes, Superficial Mycoses, Deep mycoses & opportunistic, Fungi.

**UNIT-6: Virology**

Viruses, Introduction, General Properties & Classification. Common Viral infection, outline of lab diagnosis &, HIV Virus, Hepatitis -B Virus.

**UNIT-7: Parasitology**

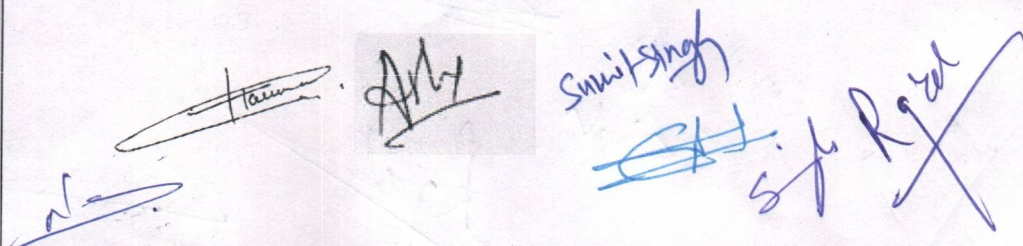
Morphology, Life Cycle, Outline of Lab Diagnosis & Classification, *Plasmodium falciparum*, *Toxoplasma* & *Giardia*. **Protozoa:** *E. histolytica*, General properties, classification, list of diseases caused by: Intestinal Nematodes & Tissue Nematodes.

**Text Book:**

1. Text Book of Microbiology for Nursing Students, Anant Narayan & Panikar
2. Text Book of Ophthalmology, Khurana

**Reference Book:**

1. Text Book of Microbiology, Baveja.



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**Course Title / Subject Names: Basic Pathology & Hematology**  
**Course Code / Subject Code: BCT 204**

**Course Objectives:**

1. The student should submit the appropriate tissue sections per protocol to demonstrate the lesion and other clinically-relevant information needed for the final pathologic report.
2. To aid hematology in the reference ranges for hemoglobin, hematocrit, erythrocytes, and leukocytes in infants, children and adult.

**Course Outcomes:**

1. Understand the importance of clinical information in supporting a timely, accurate pathological diagnosis.
2. Describe normal and disordered hematopoiesis in human body.
3. Develop implement and monitor a personal continuing education strategy and critically appraise sources of pathology related medical information.
4. Describe mechanisms of oncogenesis & demonstrate an understanding of genetics and cytogenetics pertaining to hematology

**Course Contents:**

**UNIT-1: General Pathology**

Cell Injury (Reversible, Irreversible Cell Injury), Inflammation (Acute inflammation, cells, Chronic inflammation, granuloma and examples. Circulatory disturbances (Thrombosis, Embolism, Edema: ascetic, pleural, Pericardial: effusions, Shock, Allergy, Anaphylaxis-Definition, Morphological features, and distinguishing features) Neoplasia (Definition of Anaplasia, dysplasia, metaplasia and metastasis and difference between benign and malignant lesions)

**UNIT-2: Histopathology & Cytopathology**

General principles of Histopathology techniques collection, fixation, processing & routine staining. General principles of Cytopathology techniques collection, fixation, processing & routine staining General principles of Clinical Pathology techniques sample collection. Processing for routine test, normal urine & urine examination, urine strip, introductions to body fluids (Distinguish between Transudate and exudate)

**UNIT-3: Hematology**

General principles of Hematology techniques, blood collection, anticoagulants, fixation, processing, routine staining, Hemoglobin, TLC, DLC, Peripheral smear (CBC report), platelet

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counts, cell counter working. General principles of Blood Bank techniques antigen, antibody, ABO & Rh system General principles of Autopsy & Museum

#### **UNIT-4: Systemic Pathology**

Anemia: types-Iron deficiency, megaloblastic, Aplastic-Etiology, Pathogenesis Investigation. Leukemia: Acute and Chronic, Peripheral Smear. AIDS: Definition, Pathogenesis, Mode of transmission, Two Confirmatory Test Tri-Dot, & Western blot. Hepatitis: Types, Etiology, Mode of spread. Malaria: Mode of spread. Tuberculosis: Primary and secondary TB, Granuloma formation, Mode of transmission, Organs involved.

#### **Reference Books:**

1. A Handbook of Medical Laboratory (Lab) Technology: Editor) Second Edition. V.H. Talib (Ed.).
2. Comprehensive Textbook of Pathology for Nursing: Pathology Clinical Pathology Genetics. Ak Mandal Shramana Choudhury, Published by Avichal Publishing Company | Language English
3. Textbook of Medical Laboratory Technology- Praful B. Godkar, Darshan P. Godkar
4. Medical Laboratory Technology. Methods and Interpretations – Ramnik Sood (volume 1 & 2)
5. Medical Laboratory technology a procedure manual for routine diagnostic test – vol – I, II, III. Kanai L. Mukharjee Tata Mc Graw hill pub. New Delhi.
6. Practical Pathology P. Chakraborty Gargi Chakraborty New Central Book Agency, Kolkata.
7. Theory & Practice of Histological Techniques John D. Bancroft et.al. Churchill Livingstone Printed in China.
8. Histochemistry in Pathology M.I. Filipe et.al. Churchill Livingstone, London
9. Hand Book of Histopathological & Histochemical Techniques C.F.A. Culling Butterworths Company Ltd. London.
10. A Handbook of Medical Laboratory (Lab) Technology. By V.H Talib.

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- A signature that appears to be "Smit Singh".  
- A signature that appears to be "Raj".  
- A signature that appears to be "Sik".  
- A signature that appears to be "N".

**Course Title / Subject Names: Introduction to Quality and Patient Safety**  
**Course Code / Subject Code : BCT 205**

**Course Objectives:**

1. The subject will introduce the students to the basic concepts of quality in health care and develop skills to implement sustainable quality assurance program in the health system.
2. It will sensitize them in basic emergency care, infection prevention & control with knowledge of bio- medical waste management and antibiotic resistance.

**Course Outcomes:**

1. Students will have **knowledge** about standard norm of hospital set by NABH to deliver world class health service.
2. Student will **classify** Bio-medical waste for their managements in healthcare system
3. Students will able to **enforce/provide** CPR and other first aid procedure which can save people lives in emergency situation.
4. Students will able to **analyze** emergency situation for human health towards antibiotic resistance.
5. Student will also able to **select** antibiotic, which are resistance or sensitivity.
6. Students will able to **generate** antibiotic resistance pattern for a specific antibiotic.

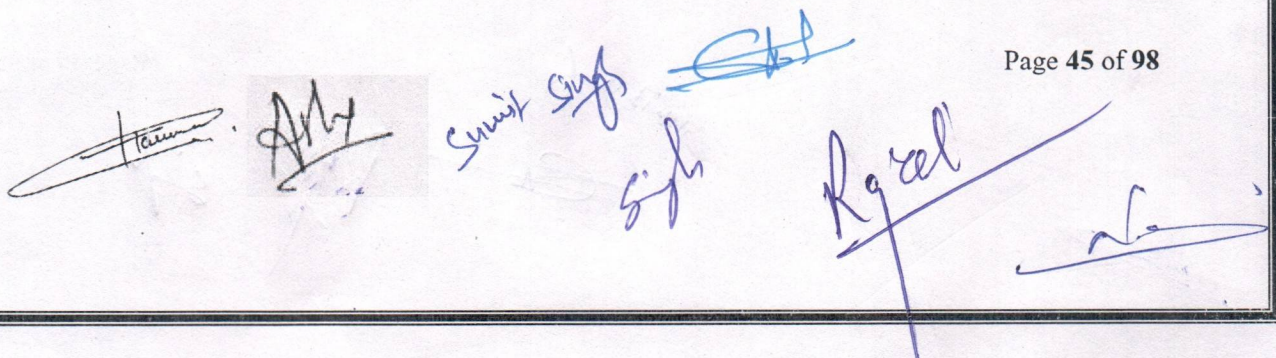
**Course Contents:**

**UNIT-1: Quality assurance and management**

Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Introduction to NABH guidelines, Basics of emergency care and life support skills - Basic life support (BLS), Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR

**UNIT-2: Bio Medical Waste Management and Environment Safety**

Definition of Biomedical Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including color coding), Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste, BMW Management & methods of disinfection, Modern technology for handling BMW, Use of Personal protective equipment (PPE), Monitoring & controlling of cross infection (Protective devices)

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### **UNIT-3: Infection Prevention and Control**

Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)], Prevention & control of common healthcare associated infections, Components of an effective infection control program, Guidelines (NABH and JCI) for Hospital Infection Control

### **UNIT-4: Antibiotic Resistance**

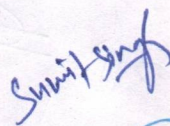
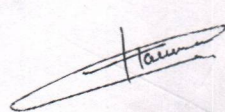
History of Antibiotics, How Resistance Happens and Spreads, Types of resistance- Intrinsic, Acquired, Passive, Trends in Drug Resistance, Actions to Fight Resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance

### **UNIT-5: Disaster Preparedness and Management**

Fundamentals of emergency management, Psychological impact management, Resource management, Preparedness and risk reduction, information management, incident command and institutional mechanisms.

#### **Reference Books:**

1. Washington Manual of Patient Safety and Quality Improvement Paperback- 2016 by Fondahn (Author)
2. Understanding Patient Safety, Second Edition by Robert Wachter (Author)
3. Handbook of Healthcare Quality & Patient Safety Author: Girdhar J Gyani, Alexander Thomas
4. Researching Patient Safety and Quality in Healthcare: A Nordic Perspective Karina Aase, Lene Schibevaag Old
5. Handbook of Healthcare Quality & Patient Safety by Gyani Girdhar J (Author)
6. Handbook of Healthcare Quality & Patient Safety by .Gyani G J/Thomas A
7. Quality Management in Hospitals by S. K. Jos



**Course Title / Subject Names: Practical for Microbiology, Pathology & Hematology**  
**Course Code / Subject Code : BCT 206**

**Course Objectives:**

1. The subject will introduce the students to the practical concepts of clinical subjects and develop skills to implement in cardiovascular cases.
2. It will sensitize them in basic emergency care, infection prevention & control with knowledge of bio- medical waste management and antibiotic resistance.

**Course Outcomes:**

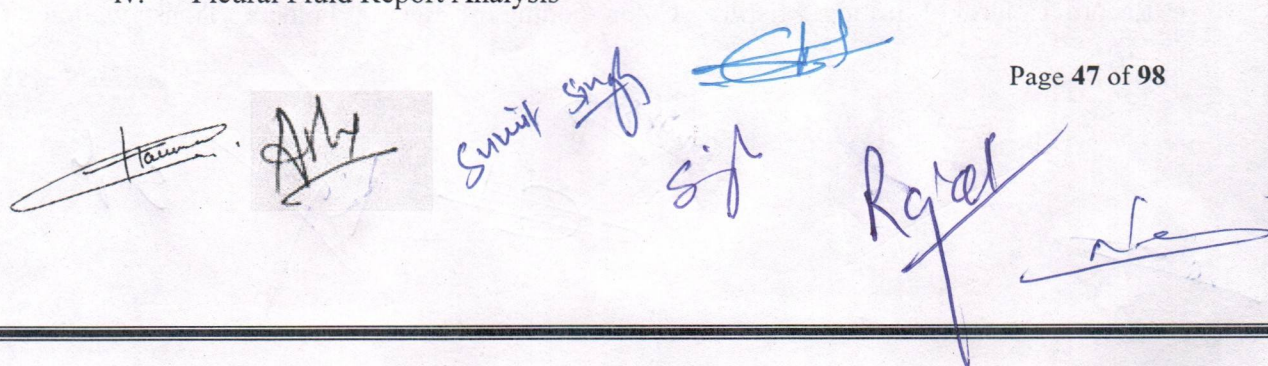
1. Students will have **knowledge** about standard norm of microbial growth control.
2. Student will **classify** Bio-medical waste for their managements in healthcare system.
3. Students will able to **analyze** emergency situation for human health towards antibiotic resistance.
4. Student will also able to **select** diagnostic techniques related to this subject.
5. Students will able to **analyses** report related to Microbiology, Pathology and Hematology.

**List of Practical: Microbiology**

1. Demonstration of working and handling of compound light microscope.
2. Demonstration of sterilization by autoclave.
3. Demonstration of sterilization by Hot Air Oven.
4. Perform Gram staining of given bacterial sample.
5. Perform Gram staining of given bacterial sample.
6. Demonstration of different types of culture media.
7. Principle, procedure and interpretation of ELISA.

**Practical List: Pathology & Hematology**

1. Estimation of Hemoglobin
2. ABO Typing
3. Cross Matching
4. Transfusion Reaction
5. Coombs Test
6. Estimation of TLC
7. Estimation of DLC
8. Report Analysis of following diagnosis
  - i. CBC
  - ii. Urine Report
  - iii. Pericardial Report Analysis
  - iv. Pleural Fluid Report Analysis

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**Course Title / Subject Names: Medical Terminology & Record Keeping**  
**Course Code / Subject Code : SEC 201**

**Course Objectives:**

1. The students will learn about terminology used in hospital as short hand reference in patient's details and book keeping.
2. This subject will elaborate knowledge about Medical Laboratory Sciences.

**Course Outcomes:**

1. Student will have **knowledge** about the suffix, prefix and roots and terminology used in healthcare systems.
2. Students will able to **summarize** suffix, prefix and basic term used for reference.
3. Students will able to **classify** medical term for their use in report writing and during discussion with doctors.
4. Students will be able to **interpret and generate** medical orders/reports.
5. Students will able to **select** the appropriate suffix and prefix during diagnosis report writing.
6. Students will have ability to **generate** data for entry and management on electronic health record system.

**UNIT-1: Introduction to Medical Terminology**

Derivation of medical terms. Define word roots, prefixes, and suffixes. Conventions for combined morphemes and the formation of plurals. Basic medical terms. Form medical terms utilizing roots, suffixes, prefixes, and combining roots. External Anatomy and Internal Anatomy, Interpret basic medical abbreviations/symbols.

**UNIT-2: Terms Relating to the Body as a Whole**

Study of the Body, Basic Structures, Cells, Tissues, Organs, Systems, Directions, Anatomic Planes and Position

**UNIT-2: Terms by Organ Systems**

Utilize diagnostic terms, surgical terms, symptomatic terms, oncology terms, operative terms, laboratory terms and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, genit0-urinary system and endocrine system.

**UNIT-4: Record Keeping**

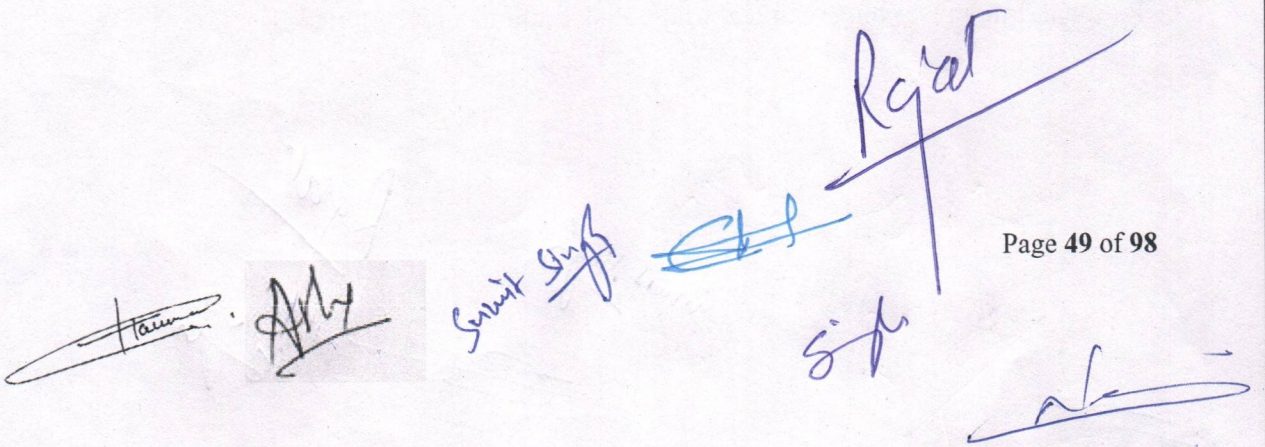
Hospital Medical Record, Content of the Medical Record, Special Records, Required Characteristics of Entries in Medical Records. Record Numbering and Filing Systems, Physical Facilities in the File Area, Protective Covers for Records, Organizational Patterns of Files, Record Control, Locating Misfiles, Color Coding of Record Folders, Transportation of

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Records, Medical Record Retention Policies Interpret medical orders/reports. Data entry and management on electronic health record system.

**Suggested Readings:**

1. An Introduction to Medical Lab Technology by F J Baker and Silverton
2. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

The bottom of the page contains several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Hanna', another signature, the name 'Sunit Singh' written vertically, a signature that looks like 'SJP', the name 'Rajat' written vertically, the initials 'SJP', and a final signature on the right.

**Course Title / Subject Names: Medical Bioethics & IPR**  
**Course Code / Subject Code : SEC 202**

**Course Objectives:**

1. To introduce the wide range of ethical issues in health care & provide basic skills of approaching ethical issues. Analysis and statement of issues relevant to ethical principles invoked.
2. Imparting knowledge and skills that will enable students to develop ethical answers to these issues to acquire specialized knowledge of law and IPR.

**Course Outcomes:**

1. Students will be able to understand ethical issues in Health care and multi-dimensionality of medical ethical concerns and uniqueness of each problem.
2. Graduate will have capacity to rationally justify your decision.
3. Develop the ability to reason through difficult medical/clinical ethical issues both orally, in the context of a group of their peers, and through written.
4. The students get awareness of acquiring the patent and copyright for their innovative works.
5. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

**Course Contents;**

**UNIT-1: Introduction to Bioethics**

Bioethical issues related to Healthcare & Medicine, Medicolegal aspects of medical records

**UNIT-2: Ethics to Anatomy & Physiology**

Cadaver ethics, Human dignity, PNDT, Disposal of cadaver, Genetic Counseling. Animal ethics, Health policy privacy

**UNIT-3: Ethics to Pharmacology**

Rational drug prescribing, Clinical trials, Risk minimization, Animal ethics

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#### **UNIT-4: Ethics to Microbiology**

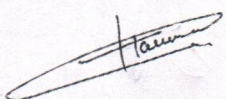
Hand wash, Drug resistance minimization, Prudence of investigation confidentiality, Sterilization procedure, Biosafety and bio hazard

#### **UNIT-5: Intellectual Property**

Introduction to Intellectual Property: Concept of Intellectual Property Kinds of Intellectual Property Patents, Copyrights Designs, Trademarks, Geographical Indication, Infringement of IPR, Its protection and Remedies Licensing and its types

#### **Reference Books:**

1. Contemporary issues in bioethics – Beauchamp & Walters (B&W) 4th edition.
2. Classic philosophical questions by Gloude (8th Edition)
3. Case book series and booklets by UNESCO Bioethics Core curriculum 2008
4. Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0028657748
5. Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
6. Intellectual Property Right- Wattal- Oxford Publication House.(1997) ISBN:0195905024.

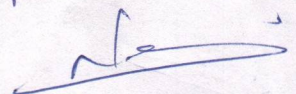


Sumit Singh



Sil

Rajat



## THIRD SEMESTER

**Course Title / Subject Names: Cardiac Pharmacology**  
**Course Code / Subject Code : BCT 301**

**Course Description:** This course will cover general pharmacology with special emphasis on common drugs used, route of administration, types of formulations, dose and frequency of administration, side effects and toxicity, management of toxic effect, drug interaction, knowledge of chemical and trade names, importance of manufacture and expiry dates and instructions about handling each rerecording and charting of the drug.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1. Demonstrate the Drug Dosage Calculation
- CO2. Demonstrate the drug Dispensing and Storage of Drugs in Safe Containers
- CO3. Recording, Charting of the Drug used for Clinical Emergencies
- CO4. Reporting of Errors and Breakage of the Drug
- CO5. Demonstrates the use of drugs in various Diagnostic and Emergency Procedures
- CO6. Work individually or in teams to solve problems with effective communication.

### Course Contents:

#### UNIT-1: ANTI-ANGINAL AGENTS

Introduction of pharmacology, route of administration, dosage preparation, Beta blockers- propranolol, atenolol, metoprolol, bisoprolol carvedilol, esmolol., transdermal nitrate patches Calcium channel blockers-nifedipine, verapamil, diltiazem, amlodipine, Nicorandil, Trimetazidine, Ranolazine, Ivabradine. Nitrates-nitro-glycerine, isosorbide dinitrate, isosorbide mononitrate

#### UNIT-2: ANTI-FAILURE AGENTS

Diuretics-furosemide, torsemide, thiazide diuretics, metolazone, spironolactone, combination diuretics, Angiotensin converting enzyme (ACE) inhibitors ARB (Angiotensin Receptor Blocker) – Valsartan Cosart an Telmisartan – captopril Enalapril, ramipril, lisinopril, ACE inhibitors for diabetics and hypertensive renal disease, Digitalis and acute inotropes – digoxin, dobutamine, dopamine, adrenaline, noradrenaline, isoprenaline, Beta Blockers – Carvedilol, Bisoprolol, metoprolol.

#### UNIT-3: ANTI-HYPERTENSIVE DRUGS AND ANTI- ARRHYTHMIC AGENTS

Anti-hypertensive drug: Diuretics, beta-blockers, ACE inhibitors, calcium antagonists, direct Vasodilators, centrally acting and peripherally acting vasodilators. Anti arithmetic drugs: Amiodarone, adenosine, verapamil, diltiazem, lidocaine, mexiletine, Phenytoin, flecainide, bretylium, atropine, Isoprenaline, Angiotensin Receptor Blocker – Valsartan Losartan Telmisartan Olmesartan

#### **UNIT-4: ANTITHROMBOTIC AGENTS**

Platelet inhibitors: aspirin, clopidogrel, Prasugrel, ticagrelor  
Anticoagulants: heparin, low molecular weight heparin, warfarin, fondaparinux  
Fibrinolytics: streptokinase, urokinase, Tenecteplase, alteplase  
Glycoprotein 2b3a antagonists: abciximab, tirofiban, eptifibatid

#### **UNIT-5: MISCELLANEOUS DRUGS**

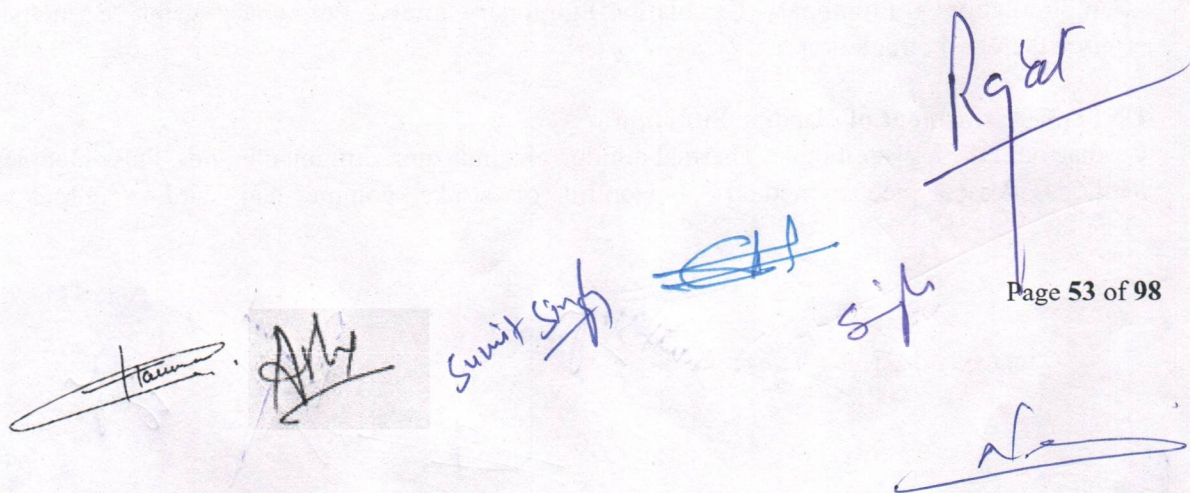
Protamine, Narcotics: morphine, pethidine, fentanyl, Sedatives: diazepam, midazolam, Steroids: hydrocortisone, prednisolone, Antihistamines: diphenhydramine, Antibiotics: penicillin, cephalosporins, aminoglycosides, Antacids and proton pump inhibitors  
Anesthetic agents: local general

#### **TEXT BOOKS:**

1. D Tripathi books of Essentials of Medical Pharmacology, 8th Edition, Jaypee brothers' medical publishers, 2018

#### **REFERENCE BOOKS:**

1. Tara V. Shanbaug Pharmacology for Nurses and Medical Graduates, 4th Edition, Elsevier, 2020

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**Name of Course: Cardiovascular Anatomy & Physiology**  
**Course Code: BCT 302**

**Course Description:**

1. Describe the structure and function of the heart including the electrical activity involved in the normal and abnormal cardiac cycle.
2. Describe the structure and function of the myocytes & function of the peripheral and coronary circulatory systems at rest and during physical activity
3. Discuss Anatomy of Coronaries of Heart.
4. Discuss the factors which impact the cardiac output and identify those factors impacted by physical activity and environmental factors.
5. To understand Indication and Contraindications, Uses and Adverse effects of drugs, Mechanism of Action

**COURSE OUTCOMES:**

1. Students will be able to understand Coronary Anatomy.
2. Graduate will be able to differentiate between normal heart sounds and murmurs.
3. To enable students, a preliminary understanding of the circulatory system from a physiological and functional perspective, as well as related terminologies.
4. Students will be proficient in Pharmacology with proficient knowledge about the different drugs / medicines to be given in various cardiovascular diseases, dose calculation and mode of administration.
5. Also recent advances in pharmacology will play a key role in research aspect of the students.

**Course Contents**

**UNIT-1: Anatomy of the Heart and Great Vessels**

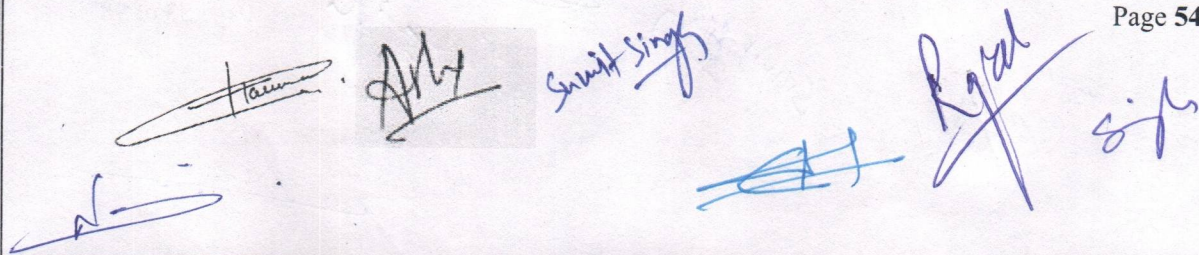
Anatomy of the heart and great vessels • Gross anatomy and structural features of cardiac chambers Atrium, Ventricle, AV junction, Heart valves, Specialized conduction tissues, Sinus node, Inter nodal tracts, AV node, Bundles • Innervations of the heart – Sympathetic, Parasympathetic, Sensory. • Anatomy of the respiratory system

**UNIT-2: Coronary Vascular System**

Coronary arteries, Myocardial capillary bed, Venous drainage, Lymphatic drainage, • Systemic Circulation-Arterial system, Venous system, Lymphatic system, Tissue perfusion and microcirculation • Pulmonary Circulation-Pulmonary artery, Pulmonary veins, Bronchial artery • Cerebral circulation

**UNIT-3: Assessment of Cardiac Function**

Cardiac output-Fick's principle, Thermal dilution and indicator, dilution methods, Pulse Doppler methods, Miscellaneous methods • Control of stroke volume and cardiac output •



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Hemodynamics – Relationship between pressure, flow and resistance, Solute transport between blood and tissues, Circulation of fluid between plasma, interstitium and lymph

#### **UNIT-4: Vascular Smooth Muscle Functions**

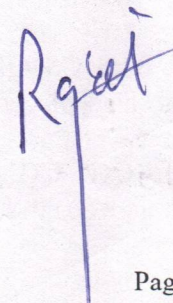
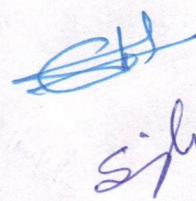
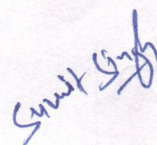
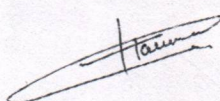
Mechanism of contraction, Pharmacochemical coupling, automaticity - Control of blood vessels - Local control mechanisms, Nervous control, • Specialization in individual circulation - Coronary circulation, Cerebral circulation, Pulmonary circulation, Cardiovascular receptors, reflexes and central control: Coordinated cardiovascular responses, Posture, Valsalva manoeuvre exercise, Diving reflex, cardiovascular responses in pathological situations, Shock and haemorrhage, Syncope, Essential hypertension, Chronic cardiac failure

#### **UNIT-5: Radiology for Cardiac Care**

Principle of X-ray, CT scan, MRI & Angiography, Radiography, Angiography, Fluoroscopy, Image intensifier and multi-section radiography. Alpha, Beta, & Gamma emission, Principle of radiation detector, dot scanner, nuclear angiogram & Principle of Radiotherapy.

#### **Reference Books:**

1. Inderbir Singh, Textbook of Anatomy, Jaypee Brothers Publication, 7th Edi, Vol I to III, 2019
2. Chaurasia, Human Anatomy, CBS Publisher, 5th Edi, Vol 1 to 3, 2010.
3. Ross and Wilson Anatomy and Physiology in Health and illness, Elsever, 13th Edi, 2018.



**Name of Course: Basic Electrocardiography**  
**Course Code: BCT 303**

**Course Description:** Acquire knowledge about equipment used, working principles and applications of electrodes, ECG machine, TMT and Holter. Understand the basic ECG deflexions and interpretation of normal ECG and acquire knowledge on ECG features of chamber enlargements and conduction disturbances. Understand the role of exercise stress testing and Holter monitoring in diagnosing cardiac conditions.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to understand:

- CO1.** Understand the ECG machine, its working principle and artifacts of ECG.
- CO2.** Acquire knowledge on normal ECG deflexions, its ECG features and Interpretation of ECG
- CO3.** Acquire knowledge on chamber enlargements and conduction disturbances and its ECG characteristics.
- CO4.** Understand the concept, equipment used, indications and contraindications, protocols, procedure and interpretation of exercise stress testing.
- CO5.** Understand the concept, equipment used, indications and contraindications, protocols, procedure and interpretation of Holter monitoring.

**Course Contents:**

**UNIT-1: BASIC ELECTROPHYSIOLOGY**

Heart: An electrical field, Electrical and Mechanical properties of the heart, Cardiac electrical field generation during activation, Cardiac wave fronts - Action potential: Repolarization and Depolarization, Cardiac electrical field generation during ventricular recovery, Conduction system of the heart: In detail

**UNIT-2: BASICS OF ELECTRODE PLACEMENT AND LEAD SELECTION AND AXIS DEVIATION**

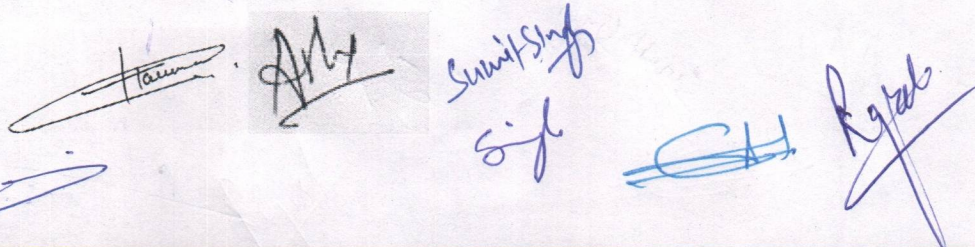
Basics of Electrodes and Leads, ECG deflexions: Isoelectric, Upright, Negative and Biphasic, Types of ECG leads- Standard limb leads, Precordial leads and the Wisdom central, Augmented limb leads, Unipolar V/S Bipolar leads, Placement of leads with universal color code, Hexa-axial reference frame and Electrical axis, X axis – time presentation, Y axis – voltage presentation, Right & Left axis in normal ECG, Einthoven's Triangle, Deviation of Axis.

**UNIT-3: BASICS OF STRESS TEST**

Protocols, lead placement, instruction to the patient, rhythm analysis.

**UNIT-4: ECG COMPONENTS-WAVES AND INTERVALS**

ECG waveforms: Rate, Rhythm and Normal time intervals-The Normal



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**Name of Course: Basic Echocardiography**  
**Course Code: BCT 304**

**COURSE DESCRIPTION:** Understand the basic principles of ultrasound and gain knowledge of equipment's used, working principle and clinical applications of different modalities used in echocardiography and cardiac catheterization.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to understand:

- CO1.** Understand the history, basic principles of ultrasound, its clinical applications and transducer design, types and its uses.
- CO2.** Acquire knowledge on transmission of US energy, image creation, signal processing and different modes used in echocardiography.
- CO3.** Acquire knowledge on different types of echo machine, knobs of echo machine and make use of instrumentation in image optimization.
- CO4.** Understand basic principles of Doppler Echocardiography and acquire knowledge on types, uses, limitations of Doppler Echocardiography.
- CO5.** Acquire knowledge about X ray production, types of equipment, hardware's used in Cath lab and its clinical applications.
- CO6.** Understand the importance of radiation safety measures and sterility maintenance in cathlab.

**Course Contents:**

**UNIT-1: INTRODUCTION TO ECHOCARDIOGRAPHY:**

Basics Of Ultrasound Waves, Characteristics of Sound Wave, Frequency and Attenuation, Basic Principle of Echocardiography, Indications of Echocardiography, Types of Echocardiography, Importance of Gel in Echocardiography. Types Of Murmurs Heard in Echocardiography- Systolic and Diastolic Murmurs, Possible Causes of Murmurs, Conditions Associated with Murmurs, Features of Murmurs Suggesting Echocardiography

**UNIT-2: ECHOCARDIOGRAPHY TECHNIQUES**

Basic principles, indications and uses of 2D Transthoracic Echocardiography, M-Mode, Echo Windows & Views Used In Transthoracic Echocardiography, Doppler Echocardiography In Detail: Pulsed, Continuous Wave And Color Flow Mapping. Transducer: Basic Principle and Working, Types of Transducers, Piezoelectric Crystals and Its Effect, Various Knobs Used on Echo Machine with Its Description and Application

**UNIT-3: CARDIAC ASSESSMENT & DOPPLER EFFECT**

Measurement of Cardiac Dimensions, Basics of Evaluation of Systolic and Diastolic Left Ventricular Function, Ejection Fraction, Fractional Shortening, Regional Wall Motion Abnormalities: Classification, Stroke Volume and Cardiac Output Assessment, Transvalvular Gradients and Orifice Area. **Doppler Effect:** Basics Of Doppler, Applications

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Electrocardiogram, The Normal P wave & Atrial repolarization, Atrioventricular node conduction and the PR segment, Ventricular activation and the QRS complex, Genesis of QRS complex, Ventricular recovery and ST-T wave, Normal variants and Rotation of the heart, ECG PAPER, Rate measurement: Six second method, large box method, small box method

**UNIT-5: SINUS RHYTHMS & ATRIOVENTRICULAR BLOCKS (Description, Possible causes, ECG criteria, Plan of assessment, Potential treatments)**

Normal Sinus Rhythm, Sinus Bradycardia, Sinus Tachycardia, 1st Degree AV block, 2<sup>nd</sup> Degree AV block: Type-I or Mobitz-I, 2<sup>nd</sup> Degree AV block: Type-II or Mobitz-II, 3<sup>rd</sup> Degree AV block/ CHB

**UNIT-6: BASICS OF ECG INTERPRETATION**

Basic steps for interpretation- Rate, Rhythm, P-wave examination, P to R interval, QRS width, Rhythm interpretation

**UNIT-7: ATRIAL & VENTRICULAR ARRHYTHMIAS (Description, Possible causes, ECG criteria, Plan of assessment, Potential treatments)**

Premature Atrial Contractions (PACs), Atrial Flutter (AF), Atrial Fibrillation (A. Fib), Paroxysmal Atrial Tachycardia, Premature Ventricular Contractions (PVCs), Ventricular Tachycardia (V.Tach), Supraventricular Tachycardia (SVT), Ventricular Fibrillation (V. Fib), Asystole

**Practical:**

- |  |        |
|--|--------|
| 1. Steps to perform an ECG                                   | 5 Hrs. |
| 2. Patient positioning according to various conditions.      | 5 Hrs. |
| 3. Proper communication with patient to find out the history | 5 Hrs. |
| 4. ECG machine operating and maintenance                     | 5 Hrs. |
| 5. Maintain ECG catalogue for self-assessment                | 5 Hrs. |
| 6. Common errors in ECG recording                            | 5 Hrs. |

**Reference Books:**

1. ECG Made Easy –Atul Luthra
2. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test
3. An Introduction to Electrocardiography: Schamroth Colin
4. Clinical Electrocardiography: Goldberger. A

of Doppler, Types of Doppler, Continuity Equation

#### **UNIT-4: ECHOCARDIOGRAPHY ASSESSMENT IN VALVULAR HEART DISEASE**

Role of Echo in Assessment of Diseases, 2D Findings, Doppler Calculations, M-Mode Findings and Views Seen In: Mitral Regurgitation, Mitral Stenosis with Different Types Of M-Mode Pattern, Mitral Valve Prolapse, Aortic Regurgitation, Aortic Stenosis: Types Of AS, Infective Endocarditis, Tricuspid Regurgitation, Tricuspid Stenosis, Pulmonary Regurgitation Pulmonary Stenosis

#### **UNIT-5: ECHO IN SPECIAL HOSPITAL SETTINGS**

Clinical Uses of Echocardiography In: Preoperative Cases, Intraoperative Cases, Intensive Care UNIT (ICU), Coronary Care UNIT (CCU), Cardiac Catheterization Laboratory (CCL), Accident & Emergency (A & E) Department, Portable (Hand-Held) Echo.

#### **UNIT-6: ECHO ASSESSMENT IN CAD**

Assessment of Ischemia, Assessment of Myocardial Infarction, Complications of MI Detection by Echo, Myocardial Hibernation

#### **UNIT-7: ARTIFICIAL (PROSTHETIC) VALVES**

Basics of Artificial Valves, Types of Artificial Valves, Echo Examination of Prosthetic Valve, Basics of Prosthetic Valve Malfunction, Echo Assessment of Endocarditis, Thrombus, Dehiscence, Regurgitation, Variance, Degeneration

#### **Text Books:**

1. Echo Made Easy: Sam Kaddoura
2. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
3. Feigen Baum's Echocardiography
4. Tajik Jamil for Echocardiography.

**Name of Course: Professional Value & Human Rights**

**Course Code: AEC 301**

**Course Contents:**

**UNIT-1: Background**

Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights

**UNIT-2: Human Right**

**Human rights at various level-** Human Rights at Global Level UNO,

**Instruments:** U.N. Commission for Human Rights, European Convention on Human Rights.

**UNIT-3: Human rights in India**

Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, composition, Powers and Functions, National Commission for Minorities, SC/ST and Woman

**UNIT-4**

**Human Rights Violations** -Human Rights Violations against Women, Children, Violations against Minorities SC/ST and Trans-genders, Preventive Measures.

**UNIT-5**

**Professional values-** Integrity, Objectivity, Professional competence and due care, Confidentiality

**UNIT-6**

**Personal values-** ethical or moral values, Attitude and behavior- professional behavior, treating people equally

**UNIT-7**

**Code of conduct-** professional accountability and responsibility, misconduct, Cultural issues in the healthcare environment

**Reference Books:**

1. Jagannath Mohanty Teaching of Humans Rights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi 2009
2. Ram Ahuja: Violence Against Women Rawat Publications Jewahar Nager Jaipur. 1998.
3. Sivagami Parmasivam Human Rights Salem 2008
4. Hingorani R.C.: Human Rights in India: Oxford and IBA New Delhi.

**Name of Course: Medical Psychology**

**Course Code: AEC 302**

**COURSE DESCRIPTION:** This course provides a detailed discussion on various behavioral patterns of individuals, theories of development, normal and abnormal aspects of motor, social, emotional, and language development, and communication and interaction skills appropriate to various age groups.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand the fundamental concepts of psychology and its branches.
- CO2** Acquire knowledge of basic concepts of growth and development of personality.
- CO3** Apply the concepts of Attention, Perception, and Sensation to assess the psychology of humans.
- CO4** Understand the fundamental concepts of conflicts, frustration, and its type.
- CO5** Analyse the theoretical concepts of Intelligence and Emotions.
- CO6** Acquire knowledge of basic theories of learning and types of personality.

**Course Contents:**

#### **UNIT-1: INTRODUCTION TO PSYCHOLOGY**

**Schools:** Structuralism, functionalism, behaviorism, Psychoanalysis. **Methods:** Introspection, observation, inventory, and experimental method. **Branches:** pure psychology and applied psychology; Psychology and physiotherapy

#### **UNIT-2: GROWTH AND DEVELOPMENT**

Life span: Different stages of development (Infancy, childhood, adolescence, adulthood, middle age, old age)., Heredity and environment: Role of heredity and environment in physical and psychological development, "Nature v/s Nurture controversy

#### **UNIT-3: ATTENTION, PERCEPTION AND SENSATION**

Sensation: Vision, Hearing, Olfactory, Gustatory and Cutaneous sensation, movement, equilibrium, and visceral sense., Attention: Types of attention, Determinants of attention (subjective determinants and objective determinants)., Perception: Gestalt principles of organization of perception (principle of figure-ground and principles of grouping), factors influencing perception (experience and context). Illusion and hallucination: Different types.

#### **UNIT-4: MOTIVATION, FRUSTRATION AND CONFLICT**

Motivation: Motivation cycle (need, drive, incentive, reward), Classification of motives, Abraham Maslow's theory of need hierarchy, Frustration: sources of frustration., Conflict: types of conflict, Management of frustration, and conflict

#### **UNIT-5: INTELLIGENCE AND EMOTIONS**

Three levels of analysis of emotion (physiological level, subjective state, and overt behavior). Theories of emotion., Stress and management of stress., Intelligence: Theories of intelligence, Distribution of intelligence, Assessment of Intelligence., Reasoning: Deductive and inductive reasoning. Problem-solving: Rules in problem-solving (algorithm and heuristic)., Creative thinking: Steps in creative thinking, traits of creative people.

#### **UNIT-6: INTELLIGENCE AND EMOTIONS**

Factors affecting learning. Theories of learning: trial and error learning, classical conditioning, Operant conditioning, insight learning, social learning theory. The effective ways to learn: Massed/Spaced, Whole/Part, Recitation/Reading, Serial/Free recall, Incidental/Intentional learning, Knowledge of results, association, organization, and mnemonic methods. Personality Approaches to Personality: type & trait, behavioristic, psychoanalytic, and humanistic approach. Personality Assessment: observation, situational test, questionnaire, rating scale, interview, and projective techniques. Defence Mechanisms: denial of reality, rationalization, projection, reaction formation, identification, repression, regression, intellectualization, undoing, introjection, acting out

#### **BOOKS:**

1. Robert A Baron -Text Book Psychology, Jaypee Publishers, 2020
2. T. Ramalingam, Psychology for Physiotherapist – Jaypee Publishers 2nd Edition, 2019
3. Niraj Ahuja-Text Book of Psychiatry-Jaypee Publishers, 4th Edition, 2019

**Name of Course: Cardiovascular Disease: Pertinent to Cardiovascular Technology**  
**Course Code: BCT 402**

**Course Outcomes:**

1. This course will cover common cardiovascular diseases, their related pathology and microbiology.
2. Along with outline of clinical presentation and management of these conditions it also includes Medical and Surgical interventions.

**Course Contents:**

**UNIT-1: VALVULAR HEART DISEASE**

Acquired Valvular heart disease, **Rheumatic fever and Rheumatic heart disease:** Aortic stenosis, Aortic regurgitation, Mitral valve disease, Mitral stenosis, Mitral regurgitation, Combined valvular heart disease, Tricuspid valve disease, Infective endocarditis

**UNIT-2: CORONARY ARTERY DISEASE**

Pathophysiology and clinical recognition of Angina Pectoris, Pathophysiology of Coronary Artery Disease, Myocardial Infarction, Treatment for Coronary Artery Disease

**UNIT-3: HYPERTENSION**

Etiology of Hypertension, Systemic hypertension, Essential and secondary hypertension, Treatment for hypertension, DASH diet, Pulmonary Hypertension, Pulmonary thrombo-embolism

**UNIT-4: HEART FAILURE & Cardiac Arrest**

Types of Heart failure- Left, Right, Biventricular, Acute Decompensated Heart Failure, Pathophysiology of Heart failure, Causes, Signs and symptoms, Medical management, Surgical treatment. **Cardiac Arrest:** Classification, 6 H's and 6 T's, Signs and Symptoms, Diagnosis, Treatment

**UNIT-5: MYOCARDIAL DISEASES**

Dilated cardiomyopathy, Hypertrophic cardiomyopathy, Restrictive cardiomyopathy, Myocarditis

**UNIT-6: CONGENITAL HEART DISEASES**

**A cyanotic heart disease** -Atrial septal defect (ASD), Ventricular septal defect (VSD), Patent ductus arteriosus (PDA), Coarctation of Aorta (CoA), **Cyanotic congenital heart disease** - Tetralogy of Fallot (TOF), Double Outlet Right Ventricle (DORV), Pulmonary Atresia, Transposition of Great Arteries (TGA), Total Anomalous Pulmonary Venous Connection (TAPVC)

**UNIT-7: PERICARDIAL & PERIPHERAL VASCULAR DISEASES**

Pericardial effusion, Constrictive pericarditis, Cardiac tamponade, Pericardiocentesis. Atherosclerotic peripheral vascular disease, Aortic aneurysms, Aortic dissection, Takayasu arteritis

**UNIT-8: COPD**

## FOURTH SEMESTER

**Name of Course: Development of Cardiovascular System: Fetal & Neonatal**  
**Course Code: BCT 401**

### Course Outcomes:

1. **CO1:** This course will provide overall information of the structural development of the cardiovascular system.
2. **CO2:** To encourage student to apply this knowledge to understand developmental anomalies in Cardiovascular System.

### Course Contents:

#### UNIT-1: EARLY DEVELOPMENT OF EMBRYO

Early development of embryo, Early blood vessel formation, Intra-embryonic blood vessel, Extra-embryonic blood vessel

#### UNIT-2: DEVELOPMENT OF THE HEART

Formation and position of the heart tube, Formation and position of the heart loop, Mechanism of cardiac looping, Formation of the embryonic ventricle, Development of the sinus venosus, Formation of the cardiac septa, Atrial septation, The atrio-ventricular canal, The muscular interventricular septum, The septum in truncus arteriosus and the cordis conus

#### UNIT-3: FORMATION OF THE CARDIAC VALVES

Formation of the cardiac valves, The atrioventricular valve, The semilunar valve.

#### UNIT-4: FORMATION OF THE GREAT SYSTEMIC VEINS

The cardiac veins, The vitelline veins, The umbilical veins, The vena cava

#### UNIT-5: FETAL & NEONATAL CIRCULATION

Blood flow pattern, oxygenation & venous return to the heart, Cardiac output and its distribution, Intra - cardiac vascular pressure, Myocardial function & its energy metabolism

#### UNIT-6: CHARACTERISTICS OF FETAL CIRCULATION AND CHANGES OCCUR AT BIRTH:

Postnatal circulation in detail

#### UNIT-7: ETIOLOGY OF CARDIOVASCULAR MALFORMATION

Congenital anomalies in detail

#### UNIT-8: ADULT CIRCULATION

Systemic Circulation, Pulmonary Circulation

### Reference Books:

1. Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waugh and Allison Grant
2. Principles of Anatomy & Physiology, 12th Edition by Gerard J. Tortora & Bryan Derrickson
3. Human Embryology; Inderbir Singh

**Name of Course: Cardiac Instrumentation**  
**Course Code: BCT 403**

**COURSE DESCRIPTION:** Understand the basic principles of ultrasound and gain knowledge of equipments used, working principle and clinical applications of different modalities used in echocardiography and cardiac catheterization.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to understand:

- CO1.** Understand the history, basic principles of ultrasound, its clinical applications and transducer design, types and its uses.
- CO2.** Acquire knowledge on transmission of US energy, image creation, signal processing and different modes used in echocardiography.
- CO3.** Acquire knowledge on different types of echo machine, knobs of echo machine and make use of instrumentation in image optimization.
- CO4.** Understand basic principles of Doppler Echocardiography and acquire knowledge on types, uses, limitations of Doppler Echocardiography.
- CO5.** Acquire knowledge about X ray production, types of equipment, hardware's used in Cath lab and its clinical applications.
- CO6.** Understand the importance of radiation safety measures and sterility maintenance in cathlab.

**Course Contents:**

**UNIT-1: INTRODUCTION TO MEDICAL PHYSICS & ELECTROPHYSIOLOGICAL MEASUREMENTS**

Basics, Indications, Outcome, Machines related to Medical Physics. Electrodes – Limb electrodes, floating electrodes, pregelled disposable electrodes, Microneedle and surface electrodes, ECG: Lead systems and recording methods, Typical waveforms, Electrical safety in medical environment: shock hazards, leakage current, Instruments for checking safety parameters of biomedical equipment, Transducers: selection criteria, Piezo electric ultrasonic transducers

**UNIT-2: NON-ELECTRICAL PARAMETER MEASUREMENTS**

Measurement of blood pressure, Cardiac output, Stethoscope: Heart rate, Heart sound, ACT, Pulmonary function measurements – Spirometer, Photo Plethysmography, Body Plethysmography, Blood Gas analyzers: pH of blood, measurement of blood pCO<sub>2</sub>, pO<sub>2</sub>, finger-tip oximeter - ESR, GSR measurements.

**UNIT-3: ASSISTING, AND THERAPEUTIC EQUIPMENTS**

Types of Pacemakers, Types of Defibrillators, Ventilators- Types of Ventilators.

**UNIT-4: MEDICAL IMAGING**

C-Arm, Coronary Computer tomography & MRI, TLD, Radiographic and fluoroscopic techniques: Echocardiography: TTE, TEE, Stress Echo, Coronary Angiography, PTCA

Causes, Stages of COPD (Stage 1-4), Signs and Symptoms, Diagnosis, Treatment: Medication, Dietary changes, Lifestyle changes

**Reference Books:**

1. Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne Waugh and Allison Grant
2. Principles of Anatomy & Physiology, 12th Edition by Gerard J. Tortora & Bryan Derrickson
3. Essentials of Medical Physiology, Sixth Edition by K Sembulingam and Prema Sembulingam
4. Physical Examination of the Heart and Circulation, Fourth Edition by Joseph K. Perloff

### Practicals:

1. ECG Machine	6 Hrs.
2. Stress Test Machine	6 Hrs.
3. Patient monitor	6 Hrs.
4. Central Monitoring System	6 Hrs.
5. Sphygmomanometer	6 Hrs.
6. Pulse Oximeter	6 Hrs.
7. Stethoscope	6 Hrs.
8. Defibrillators	6 Hrs.
9. Pressure transducers	6 Hrs.
10. Techniques of monitoring radiation exposure	6 Hrs.

### Text Books:

1. R. S. Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI

### Reference books or related websites:

1. M. Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E. Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J. Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C. Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman Ltd, 2000.

**Name of Course: Cardiac Catheterization-I**  
**Course Code: BCT 404**

**COURSE DESCRIPTION:** Acquire knowledge about diagnostic approach of cardiac catheterization, Understand the fundamental principles of hemodynamic measurements and gain knowledge of various pressure measurements and apply it to diagnose various cardiac diseases. Understand standard angiographic techniques, equipments, materials used, and post procedural care of angiographic procedures.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

**CO1.** Acquire knowledge about materials used, prerequisites and equipment used for angiographic procedures.

**CO2.** Understand the basics of cardiac hemodynamics, pressure measurements and application it in diagnosing various pathologies.

**CO3.** Acquire knowledge on standard angiographic views, hardwares used, procedural techniques and role of post procedural care of angiographic procedures.

**CO4.** Acquire knowledge about materials used, angiographic views, hardwares used, procedural techniques and role of post procedural care of aortic and peripheral vascular diseases.

**CO5.** Acquire knowledge to take measures to interpret various catheterization complications and its management techniques.

**Course Contents:**

**UNIT-1: INTRODUCTION TO CARDIAC CATH PROCEDURES**

Guidelines for diagnostic catheterization; Prerequisites for cath procedures: premedication, anaesthesia and other investigations; Catheterization equipment and diagnostic catheters; Vascular access: Introduction, Types – arterial and femoral, Indications and contraindications, materials used and complications; Contrast Media used in cathlab: Introduction, classification, indications, contraindications, uses, contrast dose for various procedures and complications.

**UNIT-2: CARDIAC HEMODYNAMICS AND PRESSURE MEASUREMENTS**

Cardiac Hemodynamics: systemic vascular resistance, pulmonary vascular resistance, normal intracardiac pressures; Cardiac output measurement: equipment, materials, procedure and methods, Pressure measurements: materials used, techniques and procedure, Shunt detection and quantification; Pitfalls in calculating hemodynamic variables.

**UNIT-3: ANGIOGRAPHIC TECHNIQUES -I**

Coronary Vascular System: arterial and venous anatomy., Standard Angiographic Views., Coronary angiogram: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care., Right and Left Heart catheterization: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care, Cardiac cath in VHD: calculation of stenotic orifice area.

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**Name of Course: Computer and Application**  
**Course Code: AEC 401**

**COURSE DESCRIPTION:** This course provides a detailed discussion and hands-on experience on basics of computer science and information science concepts of the I/O devices, CPU (central processing UNIT) memory, Storage devices and Introduction of windows operating systems and MS office and having the knowledge of computer networks, Internet and its applications.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Demonstrate knowledge on Basics of computer I/O devices, Processor and memory.
- CO2.** Prepare the Documents using the word processors.
- CO3.** Prepare the work sheet and Slide Presentations using the Excel and presentation tool.
- CO4.** Demonstrate the knowledge on Operating Systems usage and its types.
- CO5.** Interconnect two or more computers for Information sharing and access the Internet.
- CO6.** Work independently or in teams to solve problems with effective communication.

**Course Contents:**

#### **UNIT-1**

Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).

#### **UNIT-2**

Processor and memory: The Central Processing UNIT (CPU), main memory. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

#### **UNIT-3**

Introduction of Operating System: introduction, operating system concepts, types of operating system Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

#### **UNIT-4**

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

#### **UNIT-4: ANGIOGRAPHIC TECHNIQUES -II**

Pulmonary angiography: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care., Peripheral vascular disease: Introduction, anatomy, lower extremity peripheral artery disease., Digital subtraction angiography technique., Peripheral angiogram: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care,

#### **UNIT-5: ANGIOGRAPHY OF THE AORTA**

Angiography of the Aorta: Introduction, materials and equipment used, radiographic techniques, Indications, Contraindications, procedure and complications., Thoracic aortography: Indications, contraindications, patient preparation, materials used, procedure, complications., Carotid arteriography: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care., Renal angiography: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care.

#### **List of Practicals:**

1. Demonstration of equipments used, materials used for catheterization procedures.
2. Understanding the role of diagnostic tests as prerequisite for cath procedures
3. Knowledge of patient preparation, arrangement of materials, for various angiographic procedures.
4. Demonstration of angiographic views, techniques and its clinical importance in various angiographic procedures.
5. Understanding the basic principles of cardiac hemodynamics and its importance in diagnosing various cardiac pathologies.
6. Understanding the principles and pressure measurements of cardiac chambers by cardiac catheterization.
7. Demonstration of quantification of intracardiac shunts, and cardiac output by cardiac catheterization.
8. Demonstration how to interpretation of coronary angiogram and clinical importance in management plan.
9. Demonstration how to interpretation of peripheral and aortic angiograms and clinical importance in management plan
10. Knowledge of how to take measures to prevent complications during cath procedures and post procedural care.

#### **TEXT BOOKS:**

1. Grossman & Baim's ,Cardiac Catheterization, Angiography and Intervention, Wolters Kluwer- 8th edition, 2020.
2. Morton J. Kern, The Interventional Cardiac Catheterization Hand Book, Elsevier,4<sup>th</sup> edition, 2001.

#### **REFERENCE BOOKS:**

1. Brian Griffin, Edited by Sanjay Kumar Chugh, Manual of Cardiovascular Medicine, Wolters Kluwer, First south Asian edition, 2022.

**Name of Course: Principle of Managements**

**Course Code: AEC 402**

**Course Objectives:**

1. Subject is intended to provide a knowledge about the basic principles of Management and their working methods to achieve to outcomes in jobs.
2. To develop students' critical thinking and decision-making skills in various managerial contexts.

**Course Outcomes:**

1. Students will **learn** about different types of management involved in healthcare sector.
2. Graduates will able to **understand** time management and working cost efficiently.
3. Students will able to **apply** management concepts to analyze and solve real-world organizational problems.
4. Graduates will able to **analyze** effectively in managerial roles through written reports and presentations.
5. Students will able to **evaluate** ethical implications of managerial decisions and actions.
6. Students will able to **create** collaborate efficiently in team settings to accomplish common goals.

**UNIT-1: Introduction to Management**

Definition, Nature- Features of Management, Management Functions, Management as a Process, Importance of Management, Management and Administration. Roles of a Manager, Levels of Management. Principles of Management- Fayol's principles of management, scientific Management. Strategic Management: Meaning, Definition, Elements, Scope and Dimensions, Process, Importance, Strategic Decisions and SWOT Analysis.

**UNIT-2: Planning & Decision-making**

Meaning and Definition, Features, Steps in Planning Process, Approaches, Principles, Importance, Advantages and Disadvantages of Planning, Types of Plans, Types of Planning, Management by Objectives. Decision-making: Meaning, Characteristics, Decision-Making Process, Guidelines for Making Effective Decision, Types of Decisions.

**UNIT-3: Conflict, Stress Management, Managing change and innovation**

Definition and meaning of stress, relation between stress and performance. Causes of stress. Conflict meaning and causes, determinants of conflict, remedies of Stress and conflict management. Managing change and innovation: Definition, types of change, change management Process, change management, strategies of change management. Innovation meaning, drivers and types.

**UNIT-4: Group, Team & Leadership**

Definition and meaning, Formation of Group, Classification, Properties, Roles, norms, status, size and cohesiveness, Group decision making, understanding teams, creating effective teams. Leadership: Definition, Meaning, Factors, Theories, Principles and Leadership Styles.

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## UNIT-5

Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in clinical settings.

### Reference Book:

1. Information technology by Anshuman Sharma (Lakhanpal Publisher)
2. Computer Fundamentals (Concepts, Systems and applications) by P. K. Sinha (University of Tokyo, Japan) BPB Publications

## FIFTH SEMESTER

**Name of Course: Advance Electrocardiography**

**Course Code: BCT 501**

### **Course Description:**

1. Describe the structure and function of the heart including the electrical activity involved in the normal and abnormal cardiac cycle.
2. Describe the structure and function of the myocytes & function of the peripheral and coronary circulatory systems at rest and during physical activity

### **Course Outcomes:**

1. Students will be able to understand Coronary Anatomy & circulatory system.
2. Graduate will enable students, differentiate between normal heart sounds and murmurs.
3. To enable students, a preliminary understanding of the from a physiological and functional perspective, as well as related terminologies.
4. Students will be proficient in Pharmacology with proficient knowledge about the different drugs / medicines to be given in various cardiovascular diseases, dose calculation and mode of administration.
5. Students will be able to understand recent advances in pharmacology will play a key role in research aspect of the students

### **Course Contents:**

#### **UNIT-1: ANATOMY OF THE CONDUCTION SYSTEM & BASICS OF ELECTROPHYSIOLOGY**

SA node, AV node, Internodal and Inter-atrial conduction, Bundle branches, History, Equipment used, Procedure, Resting interval measurements, Management of Arrhythmias by EP study

#### **UNIT-2: GENESIS OF CARDIAC ARRHYTHMIAS AND MANAGEMENT**

Various Mechanisms of Arrhythmogenesis & disorders of impulse formation: Artifacts, Electrical interference, Somatic tremor, wandering baseline, Antiarrhythmic agents class I, class II, class III, class IV, Implantable electric devices for treatment of cardiac arrhythmias, Ablation theory for cardiac arrhythmias: Basic

#### **UNIT-3: ECG IN ISCHEMIC HEART DISEASE**

Coronary events and ECG, ECG changes In IHD and Myocardial Infarction, Investigations: Stress test- Indications, Contraindications, Pre-test probability, Exercise Protocols, Interpretation of reports

**UNIT-4: DISORDERS OF IMPULSE CONDUCTION:** Reentry mechanism, Tachycardia's caused by reentry, Electrical remodeling of atria, Sinus reentry, Atrial reentry, AV node reentry, Pre-excitation syndrome, Ventricular tachycardia caused by reentry, **PACEMAKERS:** Types of Pacemakers, Components of Pacemaker, Single and Double Timing cycles, Pacemaker Troubleshooting

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### **UNIT-5: Time & Cost Management**

Meaning, characteristics, objectives of Time Management Importance of Time Management.  
Cost and efficiency: Definition, Meaning, Types of Cost. Relation between cost and efficiency.

#### **Suggested Readings:**

1. R. R. Gaur, R. Sangal, G.P. Bagaria, 2009, a Foundation Course in Value Education.
2. E.F. Schumacher, 1973, Small is Beautiful: A study of Economics as if people mattered, Blond & Briggs, Britain.
3. A. Nagraj, 1998, Jeevan Vidyaek Parichay, Divya Path Sansthan, Amarkantak.
4. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
5. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
6. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

## UNIT-5

### CARDIAC PACING & RADIOFREQUENCY ABLATION THERAPY:

Indications, Temporary and Permanent Pacing, NBG codes, Types of Pacing, Complications, Common sites of Ablation, Management of A. Flutter, V. Tach, A. Fib, AVNRT

#### Practicals:

- |   |         |
|---|---------|
| 1. Learn about 12-lead ECG                                    | 20 Hrs. |
| 2. Learn about various software's associated with ECG.        | 20 Hrs. |
| 3. Learn various conditions indicated for Electrocardiography | 20 Hrs. |

#### Recommended Text Books:

1. ECG Made Easy –AtulLuthra
2. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
3. Hampton J. 2003, The ECG made Easy (6th ed.) Churchill Livingstone, Edinburgh
4. An Introduction to Electrocardiography: Schamroth Colin
5. Clinical Electrocardiography: Goldberger. A
6. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.

**Name of Course: Advance Echocardiography**  
**Course Code: BCT 502**

**Course Objective:**

1. To provide a brief introduction to Echocardiography, its techniques and types of Echocardiography.
2. To provide practically and clinically useful application of Echocardiography.
3. To explain echo techniques available and to put echo into a clinical perspective.

**Course Outcome:**

1. To develop an understanding regarding Echocardiography.
2. To train students to perform Echocardiography examinations by explaining the position of transducers.
3. To make students aware of recent advances in Echocardiography.
4. To understand the role of Cardiac Care technician while assisting the Cardiologist as well as when performing individually.

**Course Contents:**

**UNIT-1: HEART FAILURE, MYOCARDIUM AND PERICARDIUM**

Heart failure, Assessment of LV systolic function, Coronary Artery Disease, Cardiomyopathies and Myocarditis, Diastolic function, Right heart and lungs, Long-axis function, Pericardial disease, Device therapy for heart failure – Cardiac Resynchronization Therapy

**UNIT-2: TRANSESOPHAGEAL ECHOCARDIOGRAPHY**

Standard views used in TOE, Indications for TOE, Advantages and Disadvantages of TOE, Patient preparation and care during TOE, Uses of TOE, Contraindications to TOE, Complications of TOE,

**UNIT-3: CARDIAC MASSES, INFECTION AND CONGENITAL ABNORMALITIES**

Cardiac masses - Tumors (primary or secondary), Thrombus, Infected material (vegetation or abscess), Congenital Abnormalities- Shunts: ASD, VSD, PFO, Coarctation of the aorta, Congenital valvular abnormalities- Ebstein's Anomaly, Pulmonary Stenosis, Bicuspid Aortic valve.

**UNIT-4: SPECIAL SITUATIONS AND CONDITIONS**

Pregnancy, Rhythm disturbances: A. Fib, V. Fib, Syncope, Palpitations, LVH, Stroke, TIA and Thromboembolism, Breathlessness and Peripheral edema

**UNIT-5: ECHO ABNORMALITIES IN SOME SYSTEMIC DISEASES AND CONDITIONS**

HIV infection and AIDS, Chagas' disease, Lyme disease, Rheumatic heart disease, Obesity

**UNIT-6: RECENT ADVANCES IN ECHOCARDIOGRAPHY**

3D Echo, 4D Echo, Tissue Doppler Imaging

**Name of Course: Invasive Cardiology**  
**Course Code: BCT 503**

**Course Objective;**

1. To enable students, understand new techniques for procedures in and around the heart emerge that again need expert knowledge and manual dexterity.
2. To understand such interventions which include diagnostic and therapeutic electrophysiology; implantation or exchange of complex pacemaker systems or percutaneous cardioverter-defibrillator-pacers; percutaneous valve repairs or replacements etc.

**Course Outcomes:**

1. To enable students to not only be a helping hand to those just starting out in the specialty but also to serve as a reference for those who have been working in Invasive field for some time

**Course Contents:**

**UNIT-1: CONTRAST MEDIA**

Basics, Definition of Hydrophilicity, Osmolarity, and Viscosity, Contrast Agents used in the CCL, Uses, Complications, Contrast medium reactions: Mild, Moderate, Severe, Allergies: Anaphylactic and Anaphylactoid, Reaction, Contrast-Induced Nephropathy (CIN)

**UNIT-2: HEMODYNAMICS**

Introduction to Hemodynamics, Pressure Measurement System, Sources of Error and Artifacts: Fluid Artifacts, Electronic and Electrical Artifacts, Human Error: Leveling and Balancing, Slope calibration, Hemodynamic waveforms, Gradient, Valve Area Calculations, Cardiac output formulas- Fick, Ejection fraction

**UNIT-3: IVUS**

History, Angiography vs. IVUS, IVUS systems, Diagnostic Applications of IVUS, Complications of IVUS, Optical Coherence Tomography (OCT)

**UNIT-4: FUNCTIONAL ASSESSMENT OF CORONARY DISEASE**

Intravascular Pressure Measurement: Coronary Pressures and Fractional Flow Reserve

**UNIT-5: PTCA**

History, Indications, Materials used, Types of Angioplasty balloons (OTW, SOE, Fixed-wire balloons, Perfusion balloons, Compliant and Non-Compliant balloons, Stent Implantation, Contraindications, Complications

**UNIT-6: IC HARDWARES**

Stents: Composition, Types, Guidewires: Composition, Types, Catheters: Diagnostic and Guiding

**UNIT-7: IABP AND OTHER CARDIAC ASSIST DEVICES**

IABP- Physiologic Principles of Counter pulsation, Indications, Contraindications, Insertion, Timing: Timing errors, Troubleshooting, Weaning and Balloon Removal, Complications,

**Practicals:**

1. Learn about advance Echo settings. 20 Hrs.
2. Learn about qualitative reporting system along with various software's associated with Echo reporting. 20 Hrs.
3. Learn various conditions indicated for Echocardiography 20 Hrs.

**Recommended Text Books:**

1. Echo Made Easy: Sam Kaddoura
2. Reference by PGDCC – IGNOU Handbooks for ECG, ECHO and Stress Test.
3. Feigen Baum's Echocardiography
4. Tajik Jamil for Echocardiography.

**Name of Course: Cardiac Catheterization-II**  
**Course Code: BCT 504**

**COURSE DESCRIPTION:** This course helps to acquire basic knowledge about different types of hardware's and devices used in various interventional procedures. Provides the fundamental knowledge cardiac and peripheral therapeutic and interventional procedures. Understand the hemodynamics and techniques and steps of procedure with the help of diagnostic modalities and the role of technologist during the procedure, complications and its management.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

1. CO1: Understand about characteristics of commonly used catheters, stents used for interventional procedures and able to explain stent designs, properties, uses and complications.
2. CO2: Acquire knowledge about materials used, angiographic views, procedural techniques and role of post procedural care of angioplasty procedures.
3. CO3: Acquire knowledge about materials used, angiographic views, procedural techniques and role of post procedural care of device closures.
4. CO4: Acquire knowledge about materials used, angiographic views, procedural techniques and role of post procedural care of valvuloplasty procedures.
5. CO5: Acquire knowledge about materials used, angiographic views, procedural techniques and role of post procedural care of EP study and other interventional procedures.

**Course Contents:**

**UNIT-1: INTRODUCTION TO INTERVENTIONAL HARDWARES**

Interventional Catheters: Design, properties, materials used, types, uses and complications; Pacing Catheters: Design, properties, materials used, types – unipolar and bipolar pacing catheters, uses and complications; PTCA Hardwares: basic components of guiding catheters, design, properties, size selection and preparation of balloon dilatation catheters; Coronary Stents: composition, stent design, types, delivery system, advantages and complications; Peripheral stents: composition, stent design, types, method of stenting, advantages and complications, IVC filter;

**UNIT-2: ANGIOPLASTY TECHNIQUES**

Coronary Angioplasty: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; Peripheral Angioplasty: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management, Renal & Carotid angioplasty: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management;

Basics of Percutaneous ventricular assist devices: Tandem Heart, Impella, Percutaneous Coronary Bypass

#### **UNIT-8: PERIPHERAL CAROTID ANGIOGRAPHY**

Introduction, Cerebrovascular Anatomy and pathology, Diagnosis and patient selection, Patient preparation, Diagnostic procedure, Post procedure Care

#### **UNIT-9: CARDIAC PHARMACOLOGY**

Local Anesthetics, Analgesics And Sedatives: Opioids, Morphine, Fentanyl, Diazepam, Midazolam, Lorazepam, Vasodilators: Nitroglycerine, Sodium Nitroprusside, Beta receptor blockers: Metoprolol, Propranolol, Esmolol, Labetalol, Calcium Channel Blockers: Diltiazem, Verapamil, Nicardipine, Anticoagulation Agents: Platelet Aggregation Inhibitors, Aspirin, Clopidogrel, Glycoprotein IIb/IIIa Inhibitors, Tirofiban, Heparin, Warfarin, Thrombolytics: Streptokinase, Urokinase, Anistreplase, rTPA, Reteplase, Tenecteplase

#### **UNIT-11**

#### **RECENT ADVANCES IN INVASIVE CARDIOLOGY**

##### **Recommended Text Books:**

1. Invasive Cardiology, 3<sup>rd</sup> Edition by Sandy Watson.

##### **Reference books or related websites:**

2. The Interventional Cardiac Catheterization Handbook, 3<sup>rd</sup> Edition By Mortonj. Kern

**LIST OF EXPERIMENTS:**

1. Demonstration of hard wares and devices used for interventional procedures.
2. Understanding the role of diagnostic tests as prerequisite for cath procedures.
3. Knowledge of patient preparation, arrangement of materials, for various interventional procedures.
4. Demonstration of angiographic views, techniques and its clinical importance in various interventional procedures.
5. Understanding the role of cath lab technologist in assisting various interventional procedures.
6. Knowledge of how to take measures to prevent complications during interventional procedures and post procedural care.

**TEXT BOOKS:**

1. Textbook of interventional Cardiology – By Grossman
2. Manual of cardiovascular medicine – By Griffin

**REFERENCE BOOKS:**

1. Handbook of interventional Cardiology – Morten J kern
2. Practical handbook of advance interventional cardiology

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### **UNIT-3: DEVICE CLOSURES**

Device Closure of ASD, PFO: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; Device closure of VSD: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; Device closure and Coil closure of PDA: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; RSOV Device Closure: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; LAA Device closure: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management.

### **UNIT-4: VALVULOPLASTIES**

PTMC: Indications, contraindications, patient selection, materials used, procedure, complications & its management; Balloon Aortic Valvuloplasty: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; Balloon Pulmonary Valvuloplasty: Indications, contraindications, materials used, procedure, techniques and angiographic views, complications and its management; Role of echocardiography during valvuloplasty procedures

### **UNIT-5: OTHER INTERVENTIONAL PROCEDURES**

PTSMA: Introduction, indications, contraindications, materials used, procedure and its complications; Electrophysiological Studies: Introduction, Radio frequency Ablation: Indications, contraindications, patient preparation, materials used, procedure, complications and its management; Pacemaker and ICD Implantation: TPI & PPI: Indications, contraindications, patient preparation, materials used, procedure, complications and post procedural care., Pericardiocentesis: Indications, materials used, procedure, complications its management.

**Name of Course: Hospital Operation Management**  
**Course Code: SEC 502**

**Course Outcomes:**

1. Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors.
2. Communicate effectively and develop their leadership and teambuilding abilities.
3. Apply modern change management and innovation management concepts to optimize structures.
4. Analyze existing hospital service policies and enhance their alignment within the local and national context

**Course Contents:**

**UNIT-1: MEDICO-LEGAL CASES**

Introduction, Laws associated with Medico-Legal Cases, Three Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession,

**UNIT-2: CONSIDERATIONS OF ETHICS**

Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials

**UNIT-3: HOSPITAL INFORMATION SYSTEM (HIS)**

Hospital Information System Management, software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges

**UNIT-4: EQUIPMENT OPERATIONS MANAGEMENT**

Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS

**UNIT-5: ROLE OF MEDICAL RECORDS IN HEALTH CARE MANAGEMENT**

Computers for Medical records, Developments of computerized medical record information processing system (EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual

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**Name of Course: Basics of Clinical Skills Learning**  
**Course Code: SEC 501**

**Course Outcomes:**

1. After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines.
2. The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

**Course Contents**

**UNIT-1: MEASURING VITAL SIGNS & PHYSICAL EXAMINATION**

Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale. *Physical Examinations:* Observation, Auscultation (Chest), Palpation, Percussion, History Taking

**UNIT-2: FEEDING**

Enteral Feeding, NG Tube: Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parenteral Nutrition.

**UNIT-3: ADMINISTRATIONS**

Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set, Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter, Venturi Mask, face mask)

**UNIT-4: ASEPSIS**

Hand wash Techniques, (Medical, Surgical) Universal Precaution, Protecting Equipments: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire, Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment

**UNIT-6: MOBILITY AND SUPPORT**

Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints

## SIXTH SEMESTER

Name of Course: Pediatric Interventions

Course Code: BCT 601

### Course Outcomes:

1. The students will gain knowledge through proper assessment and integration of the history, physical examination.
2. Students will perform electrocardiogram, and chest X-ray.
3. Graduate will able to be diagnosed correctly in many patients, and the severity and hemodynamics correctly estimated.
4. The occurrence and management of various complications in Pediatric cardiology interventions

### Course Contents:

#### UNIT-1: TOOLS TO DIAGNOSE CARDIAC CONDITIONS IN CHILDREN

History- General principles of the cardiovascular history, Chief complaint and/or presenting sign, Physical examination- Vital signs, Cardiac examination, Laboratory examinations

#### UNIT-2: CARDIAC DEFECT CLOSURE DEVICE

Device closure procedures in Patent Foramen Ovale (PFO), Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD), Patent Ductus Arteriosus (PDA), Left Atrial Appendage (LAA)

#### UNIT-3: PERCUTANEOUS VALVE COMMISSUROTOMY, REPAIR, AND REPLACEMENT

Cardiac Valves from the left to the right: Mitral, Aortic, Pulmonic & Tricuspid valves, their pathologies: MS, MR, AS, PS, TS and treatment.

#### UNIT-4: PEDIATRIC INTERVENTIONAL CARDIOLOGY

Introduction, General Anesthesia Versus Sedation and Analgesia, Diagnostic procedures, Interventional Procedures, Device Placement. Chamber Localization & Cardiac Malposition Recent Advances in Pediatric Interventions

### Practicals:

- |  |         |
|--|---------|
| 1. Diagnosis of Cardiac conditions in children | 15 Hrs. |
| 2. Cardiac Defect Closure Devices              | 15 Hrs. |
| 3. Valve repair and replacement procedures     | 15 Hrs. |
| 4. Drugs used in Pediatric Interventions       | 15 Hrs. |

**Recommended Text Books:**

1. Invasive Cardiology, 3rd Edition by Sandy Watson.
2. Pediatric Cardiology, The Essential Pocket Guide, 3rd Edition by Walter H. Johnson, Jr.

**Reference books or related websites:**

1. THE INTERVENTIONAL CARDIAC CATHETERIZATION HANDBOOK, 3rd Edition by Morton J. Kern

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**Name of Course: Emergency Medicine & Cardiac Life Support**

**Course Code: BCT 602**

**COURSE DESCRIPTION:** This course is designed to train the skills of CPR for victims of all ages, use of an automated external defibrillator and relief of choking.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Promptly recognize several life-threatening emergencies, give high quality cardiopulmonary resuscitation and delivery appropriate ventilations.
- CO2** Identify the arrhythmias and apply high performance team management
- CO3** demonstrate the use a defibrillator in event of a cardiac emergency
- CO4** Understand types of tachyarrhythmia and understand the principles of treatment and know how to perform.
- CO5** Apply invasive and noninvasive cardiac pacing safely and effectively.
- CO6** Work individually or in teams to solve problems with effective communication.

**Course Content:**

#### **UNIT-1: BASIC LIFE SUPPORT**

Introduction of BLS, Airway, Barrier devices for giving breaths., alternative airway, Adult Basic life support., Pregnant Basic life support., post cardiac arrest., opioid algorithm choking., opioid algorithm., emergency drugs, other life-threatening emergencies, Heart attack, stroke, Drowning, Anaphylaxis, Gastro intestinal bleeding, Comparison of in hospital and out hospital.

#### **UNIT-2: ADVANCED CARDIAC LIFE SUPPORT**

Introduction, Respiratory arrest Vs Cardiac arrest, Bradycardia, Rhythm, managing bradycardia., Tachycardia, Stable and Unstable, Managing Tachycardia., Shockable rhythm, Ventricular fibrillation, Pulseless ventricular Tachycardia., Management, Non-Shockable rhythm, Pulseless electrical activity, Asystole, Management. Selected special situations, Post cardiac arrest care.

#### **UNIT-3: DEFIBRILLATOR**

Basics about defibrillation, types of defibrillators, manual external and internal defibrillator, semi-automated external defibrillator, automated external defibrillator, implantable cardioverter defibrillator, wearable cardiac defibrillator, indications of defibrillation, procedural steps for defibrillation, energy levels (joules), paddle versus adhesive patches

#### **UNIT-4: CARADIOVERSION AND PACING AND VENTILATION**

**Introduction, Basics of Cardioversion, Indications Of Cardioversion, refractory period , Abnormal rhythm, Types of cardioversion, chemical cardioversion, electrical cardioversion, procedure, Procedure, Difference between Defibrillation and cardioversion. Introduction of**

Transcutaneous pacing, indication, contraindication, procedure., Transvenousvenous pacing, indication, contraindication, procedure, ambulatory ventilator and drugs used.

**LIST OF EXPERIMENTS:**

1. Demonstration of BASIC LIFE SUPPORT
2. Demonstration of ADVANCED CARDIAC LIFE SUPPORT
3. Demonstration of defibrillator
4. Demonstration of cardioversion
5. Understanding the pacing procedure

**RESOURCES BOOKS**

1. Monstenbjork M.D. "basic life support provider manual " medical creation (2020)
2. Monstenbjork M.D "Advance cardiovascular life support provider manual" medical creation (2021)

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**Name of Course: Advance Cardiac Care Technology**  
**Course Code: BCT 603**

**COURSE DESCRIPTION:** Acquire knowledge about the fundamental principles, techniques and advantages and disadvantages of advanced techniques in the field of cardiac care. Understand the clinical importance and the role of advanced techniques in patient care.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to understand:

1. **CO1.** Acquire knowledge about materials used, prerequisites and equipment used for angiographic procedures.
2. **CO2.** Understand the basics of cardiac hemodynamics, pressure measurements and application it in diagnosing various pathologies.
3. **CO3.** Acquire knowledge on standard angiographic views, hardware's used, procedural techniques and role of post procedural care of angiographic procedures.
4. **CO4.** Acquire knowledge about materials used, angiographic views, hardware's used, procedural techniques and role of post procedural care of aortic and peripheral vascular diseases.
5. **CO5.** Acquire knowledge to take measures to interpret various catheterization complications and its management techniques.

## **COURSE CONTENT**

### **UNIT-1: ADVANCED ECG -I**

Cardiac Arrhythmias: Introduction, Genesis of cardiac arrhythmias, classification, Premature complexes – PAC, PVC, Bigeminy, Trigeminy, Couplets, Triplets, Junctional ectopics; Supraventricular tachyarrhythmias: Mechanism and ECG characteristics of Atrial tachycardia, Atrial Flutter, Atrial Fibrillation, Multifocal atrial tachycardia, AVRT and AVNRT; Ventricular tachyarrhythmias: Mechanism and ECG characteristics of Ventricular tachycardia, Ventricular Fibrillation, Torsade's de pointes, Bradyarrhythmias: SA blocks, AV blocks, Sick sinus syndrome; Asystole.

### **UNIT-2: ADVANCED ECG -II**

*Accessory Pathways:* Introduction, types and ECG characteristics; ECG in miscellaneous conditions: ECG in cardiomyopathies, myocarditis, electrolyte imbalances;

*Ambulatory ECG:* Introduction, indications, equipment, lead system, procedure, interpretation and analysis; Pacemaker Rhythm: ECG characteristics and interpretation of pacemaker rhythm

### **UNIT-3: ADVANCED TECHNIQUES IN ECHOCARDIOGRAPHY -I**

Speckle tracking echocardiography: Introduction, Strain and strain rate: Definition, technique of recording, interpretation and significance, limitations; Contrast Echocardiography: Indications, ideal properties of contrast agent, interaction of ultrasound with contrast, clinical applications of contrast echocardiography in various cardiac diseased conditions; Myocardial contrast echocardiography; 3D echocardiography: Introduction, principles, 3D Probe: design

and properties, steps involved in 3D imaging and clinical applications.

#### **UNIT-4: ADVANCED TECHNIQUES IN ECHOCARDIOGRAPHY -II**

Transesophageal echocardiography: Introduction, indications, contraindications, materials used, Equipment – TEE probe design, types, manipulation techniques, patient preparation, procedure, TEE views, complications and post procedural care; Pharmacological Stress Echocardiography: Introduction, types, Dobutamine stress echocardiography: indications, contraindications, materials used, patient preparation, procedure, complications and post procedural care, Role of DSE in valvular heart diseases; Recent advances in echocardiography: Hand held probes and portable echo machines, Role of artificial intelligence.

#### **UNIT-5: ADVANCED TECHNIQUES IN INTERVENTIONAL CARDIOLOGY**

Fractional Flow Reserve: Introduction, indications, contraindications, equipment and technique of working principle, clinical importance; Intravascular Ultrasound: Introduction, indications, contraindications, equipment and technique of working principle, clinical applications; TAVR (Transcatheter Aortic Valve Replacement): Indications, contraindications, materials used, artificial valve structure, procedure, techniques, complications and post procedural care, role of echo in TAVR; Mitra Clip: Indications, contraindications, materials used, procedure, techniques, complications and post procedural care, role of echo.

#### **LIST OF EXPERIMENTS:**

1. Demonstration, observation and interpretation of ECGs of cardiac arrhythmias.
2. Knowledge of patient preparation, materials used, procedural techniques of various noninvasive procedures.
3. Understanding the fundamental principles, procedural steps of various advanced echo procedures.
4. Demonstration, observation and interpretation of advanced echocardiographic procedures.
5. Understanding the fundamental principles, materials used of various advanced interventional procedures.
6. Demonstration, observation and interpretation and patient care of advanced interventional procedures.

#### **TEXT BOOKS:**

1. Leo Schamroth Electrocardiography
2. Feigenbaum's Echocardiography – 8th edition
3. ASE's Comprehensive Echocardiography – Roberto M.Lang, Steven A. Goldstein, 3rd edition.
4. Textbook of interventional Cardiology – By Grossman

#### **REFERENCE BOOKS:**

1. Handbook of interventional Cardiology – Morten J kern
2. Practical handbook of advance interventional cardiology

**Name of Course: Research Methodology and Biostatistics**  
**Course Code: AEC 601**

**COURSE DESCRIPTION:** This course provides a detailed Knowledge on the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand concepts of research methodology.
- CO2** Collect data for research in various methods.
- CO3** Analyse research data by using biostatistics
- CO4** Write their research or review papers to publish in journal
- CO5** Work individually or in teams to solve problems with effective communication

**COURSE CONTENT:**

**UNIT-1: FOUNDATIONS OF RESEARCH**

Definition Research, Introduction to research methods, Objectives of Research, Identifying research problem, Types of Research & Research Approaches, Research Methods vs Methodology Ethical issues in research, Research design.

**UNIT-2: RESEARCH PROBLEM AND DATA COLLECTION**

Research Problem, Measurement & Scaling Techniques, Types of Data, Research tools and Data Research Problem, Measurement & Scaling Techniques, Types of Data, Research tools and Data collection methods, Sampling methods, randomization, crossover design, placebo, blinding techniques, Developing a research proposal.

**UNIT-3: INTRODUCTION TO BIOSTATICS**

Meaning, Definition, and Characteristics of Statistics, Importance of the Study of Statistics, Understanding of data in biostatistics, Statistics in Health Science, How & where to get relevant data, Relation between data & variables, Type of variables: defining data sets.

**UNIT-4: DATA ANALYSIS AND DISSEMINATION**

Basic Principles of Data Graphical Representation, Analysis of variance & covariance. Measures of central tendency include mean, median, and mode. Probability and standard distributions

include binomial and normal distributions. Sample size calculation, Sampling techniques address sampling need, criteria, procedures, design errors, variation, and tests of significance. Statistical significance involves parametric and non-parametric tests.

#### **UNIT-5: SCIENTIFIC WRITING**

Introduction, reviewing literature, formulating research problems and proposals, integrating theory and data and understanding citation and referencing. types of reports, formal report layout, and journal standards (impact factor, citation index). importance of communicating science, challenges in scientific writing, plagiarism and its detection and writing scientific papers.

#### **TEXT BOOKS:**

1. S.P. Gupta, Statistical Methods, Sultan Chand & Sons, Edition 46,2023.
2. C.R. Kothari, Research Methodology, New age International Publisher, Edition 4, 2019.

#### **REFERENCE BOOKS:**

1. Himanshu Tyagi, Biostatistics Buster, Jaypee Brothers Medical Publishers, Edition 1,2011.
2. Bratati Banerjee, Mahajans Methods in Bistatistical for medical students and research workers, Jaypee Brothers Medical Publishers, Edition 9, 2018.

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**Name of Course: AI in Healthcare**  
**Course Code: AEC 602**

**COURSE DESCRIPTION:** This course provides a detailed discussion on Concepts of Artificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties; The Role of Major Corporations in AI in Healthcare; Applications of AI in Healthcare.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1** Understand the fundamental concepts of AI in Healthcare sector.
- CO2** Analyse the present state and future of AI in Healthcare specialties for different scenarios.
- CO3** Apply design concepts and metrics for AI in Healthcare.
- CO4** Demonstrate basic concepts and terminologies of future applications of Healthcare in AI.
- CO5** Develop AI applications through AI techniques for healthcare

#### COURSE CONTENT

##### **UNIT-1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE**

Introduction to AI in Healthcare, Benefits & Risks, AI in the health sector, AI versus human intelligence, The future of AI in health sector, AI & Neural networks.

##### **UNIT-2: THE PRESENT STATE & FUTURE OF AI IN HEALTHCARE SPECIALTIES**

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

##### **UNIT-3: THE ROLE OF MAJOR CORPORATIONS IN AI IN HEALTHCARE**

IBM Watson, The role of Google & Deep mind in AI in Healthcare, Baidu, Facebook & AI in Healthcare, Microsoft & AI in Healthcare.

##### **UNIT-4: FUTURE OF HEALTHCARE IN AI**

Evidence-based medicine, personalized medicine, Connected medicine, Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics, Incentivized Wellness, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals.

## **UNIT-5: APPLICATIONS OF AI IN HEALTHCARE**

**Case Study 1:** AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

**Case Study 2:** Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

**Case Study 3:** Delivering A Scalable and Engaging Digital Therapy.

**Case Study 4:** Improving Learning Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy.

**Case Study 5:** Big Data, Big Impact, Big Ethics: Diagnosing Disease Risk from Patient Data.

### **TEXT BOOKS:**

1. Dr. Parag Mahajan, Artificial Intelligence in Healthcare, Med Manthra Publications, First Edition 2019
2. Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health, Apress Publications, 2019.

### **REFERENCE BOOKS:**

1. Michael Matheny, Sonoo Thadaney Israni, Mahnoor Ahmed, and Danielle Whicher, Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril, National Academy of Medicine Publication, First Edition 2019.

**Name of Course: BCT Internship**  
**Course Code: BCT 701**

**COURSE DESCRIPTION:** This course provides basic knowledge on equipments used in cardiology department and provides training which deals with postings in various speciality units of the cardiology department. The students are trained to acquire skills for the actual conduct of all the clinical services entrusted to them in the specialty units of the cardiology department.

**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

1. CO1. Develop skills to perform ECG and gain practical knowledge and ability to interpret ECG.
2. CO2. Able to perform TMT, Holter analysis and gain practical knowledge and ability to interpret TMT, Holter analysis.
3. CO3. Develop skills in performing echocardiography and apply knowledge to diagnose various cardiac conditions.
4. CO4. Develop skills in handling equipments and co-ordinate with operating team and assist interventional cardiologists during catheterization procedures.
5. CO5. Work individually and in teams following ethical practice.

**INTERNSHIP:** The student must be complete the internship one year (calculated based on 8 hours per day). Students must be undertaking the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

S. No.	POSTING	DURATION
1.	ECG	2 Month
2.	TMT	2 Month
3.	Echocardiography	2 Months
4	Cardiac Radiology	2 Months
5	Cardiac ICU	2 Month
6	Cathlab	2 Month

**Evaluation:**

- I. **Logbook:** During Clinical Internship, Logbook should be carried by students and in the end of the semester it must be submitted to university.
- II. **Project Work:** As per University Guideline's students should submit mini project. The project work must be related to public health research activity, to enable them to carry

out researches and solve research related problems.

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**EVALUATION OF INTERNSHIP (LOGBOOK & VIVA VOCE\*)**

SN	Items of observation during presentation	5 Excellent	4 Good	3 Average	2 Below	1 Poor
1	Organization of the log book					
2	Adequacy of Content/ Information in the log Book					
3	Punctuality					
4	Relevance of Content/ Information in the log Book					
5	Shows professional conduct during the Teaching Learning session					
6	Timely submissions of Projects/Synopsis/Seminar effectively					
7	Work Relationship & Frequency of consulting Faculty					
8	Overall quality of department work					
<b>Total Score</b>						
Signature of the HOD						

\*Viva Voce is may be conducted as presentation followed by questions and answers.

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**PRESENTATION EVALUATION FORM**

**Evaluation of Presentation**

SN	Criteria	5 Excellent	4 Good	3 Average	2 Below	1 Poor
1	Content of the Presentation					
2	Aesthetic of slides preparation					
3	Oratory & Presentation Skills					
4	Audio- visual aids used					
5	Clarity of presentation					
6	Critical Analysis					
7	Ability to respond to questions on the subject					
8	Ability to defend the topic					
9	Referencing					
10	Implementation recent advancement on the topic					
<b>Total (50.Marks)</b>						

*Ryad*  
*25/02/26*

*Sumit Singh*  
*[Signature]*