



**Programme Structure and Course Details  
of  
B.Sc. (Hons)-Cardiac Care Technology  
2022-2026**

**Programme Code: 406**

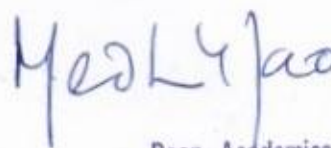


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**Faculty of Life and Allied Health Sciences  
Department of AHS**



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## UNIVERSITY'S VISION, MISSION AND OBJECTIVES

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

### Vision

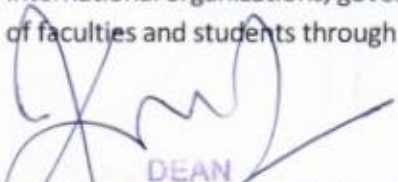
MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

### Mision

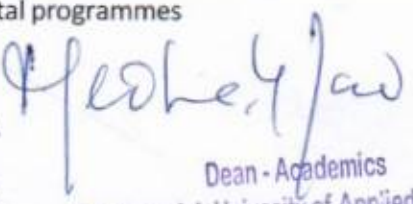
Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

### Objective

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programmes

  
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**PROGRAMME SPECIFICATIONS: B.Sc. (Hons ) - Cardiac Care Technology**

Faculty	Life and Allied Health Sciences
Programme Code	406
Programme Name	B.Sc. (Hons ) - Cardiac Care Technology
Dean of the Faculty	Dr Krishnamurthy J
Head of the Department	Dr. Tushar Shaw

**1. Title of the Award**

B.Sc. (Hons) – Cardiac Care Technology

**2. Mode of Study**

Full Time

**3. Awarding Institution /Body**

M. S. Ramaiah University of Applied Sciences

**4. Joint Award:**

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**5. Teaching Institution**

Faculty of Life and Allied Health Sciences

M. S.Ramaiah University of Applied Sciences, Bengaluru (India)

**6. Date of Programme Specifications**

July 2022

**7. Date of Programme Approval by the Academic Council of MSRUAS**

14-07-2022

**8. Next Review Date**

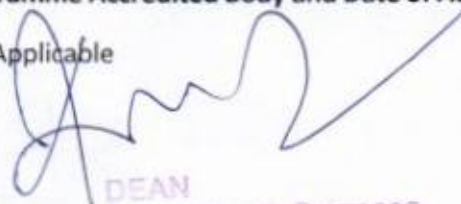
June 2026

**9. Programme Approving Regulating Body and Date of Approval**

Academic Council of MSRUAS on 14-07-2022

**10. Programme Accredited Body and Date of Accreditation**

Not Applicable

  
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#### 11. Grade Awarded by the Accreditation Body

Not Applicable

#### 12. Programme Accreditation Validity

Not Applicable

#### 13. Programme Benchmark - Not Applicable

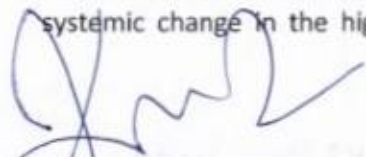
#### 14. Rationale for the Programme

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree Programme designed to create innovative problemsolvers with a multi-disciplinary approach, entrepreneurs and leaders that apply their knowledge, understanding, cognitive abilities, practical skills and transferable skills gained through systematic, flexible and rigorous learning in the chosen academic domain towards betterment of society.

With the current trends of National Education Policy (NEP) – 2020 and Self-Employment, there is a tremendous need for a young workforce with skillset that will make the students readily employable, for various roles in academia and industry. The objective is to bridge the gap between the current system of education and what is required in the 21<sup>st</sup> century. It is to have Holistic and Multidisciplinary UG Education to produce employable graduates with well-rounded personality. The Government of Karnataka had constituted a Task to suggest an Implementation Framework for NEP-2020. It had also constituted two sub- committees, one on Curriculum Reforms in Higher Education and the other on Governance and Regulations.

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree programme is driven by several compelling rationales, primarily aimed at improving the diagnosis, treatment, and overall management of cardiovascular diseases. Cardiac technologists work alongside physicians to diagnose and treat cardiac (heart) and peripheral vascular (blood vessel) disorders. They play an important role in the management of many cardiac illnesses that need extensive diagnostic and therapeutic methods.

The Task Force has suggested NEP-2020 Implementation Framework for Karnataka. The State Government has accepted the action plan and initiated steps to implement NEP-2020, as per the Roadmap suggested by the Task Force. The curriculum is outcome based and it imbibes required theoretical concepts and practical skills in the domain. By undergoing this Programme, students develop critical, analytical thinking and problem-solving abilities for a smooth transition from academic to real-life work environment. Special emphasis shall also be provided to Ability and Skill Enhancement/Vocational Courses as well as Value Added Courses. Students complete a one-year internship at hospitals to gain hands-on experience and to work as part of a team to improve practical skills and problem-solving ability. The students are required to submit a well written project report as partial fulfilment for the award of the degree, which will help develop skills of documenting scientific research methods and outcome. This Undergraduate Programme is meant to highlight systemic change in the higher education system in MSRUAS and align itself with the National

  
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### 15. Programme Mission

The purpose of the programme is to create innovative problem solvers with a multi-disciplinary approach, entrepreneurs and leaders that apply their knowledge, understanding, cognitive abilities, practical skills and transferable skills gained through systematic, flexible and rigorous learning in the chosen academic domain towards betterment of society.

### 16. Graduate Attributes

- GA-1. Ability to apply fundamental knowledge of Biology, Chemistry, Mathematics, Statistics and computer to solve real life problems in their chosen domain
- GA-2. Ability to perform administrative duties in government, semi-government, private and public sector organizations
- GA-3. Ability to teach in schools, colleges and universities with additional qualification and training
- GA-4. Ability to understand and solve scientific problems by conducting experimental investigations
- GA-5. Ability to apply appropriate tools, techniques and understand utilization of resources appropriately in various Laboratories
- GA-6. Ability to apply basic programming concepts in their chosen domains
- GA-7. Ability to understand the effect of scientific solutions on legal, cultural, social and public health and safety aspects
- GA-8. Ability to develop sustainable solutions and understand their effect on society and environment
- GA-9. Ability to apply ethical principles to scientific practices and professional responsibilities
- GA-10. Ability to work in a team, to plan and to integrate knowledge of various disciplines and to lead teams in multidisciplinary settings
- GA-11. Ability to effectively convey scientific ideas and concepts to a broad audience using both written and verbal means
- GA-12. Ability to adapt to the changes and advancements in science and engage in independent and life-long learning.

### 17. Programme Outcomes (POs) / Programme objectives:

B.Sc. (Hons) Cardiac Care Technology graduates will be able to:

At the completion of this course, the student should be able to perform medical evaluations and examinations, analyse data and use patient monitoring equipment. Curriculum also covers patient consultation conduct, ultrasounds, diagnostic and therapy treatment procedures, running an average of three years, program culminate to a hospital internship.

**PO 1- Clinical care:** Acquire and apply knowledge of basic sciences to cardiovascular system.

**PO 2- Communication:** Acquire effective verbal and written communication skills with the cardiac team members and patients.

  
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**PO 3- Membership of a multidisciplinary health team:** Discuss various case studies related to invasive & non –invasive cardiac care procedures & demonstrate the basic techniques in cardiac care.

**PO 4- Ethics and accountability at all levels:** Understand and commit to high standards of ethics in line with the code of conduct of medical practice. Adopt various quality assurance and patient safety measures while working in community or hospitals.

**PO 5- Commitment to professional excellence:** Identify, analyse and critically evaluate problems related to cardiac diseases and provide effective solutions and quality care.

**PO 6- Leadership and mentorship:** Play active role in spear heading projects relating to prevention and diagnosis of cardiac diseases.

**PO 7- Social accountability and responsibility:** Take responsibility for maintaining the highest quality of healthcare professionalism and effective interaction with patients community and health care workers.

**PO 8- Lifelong learning:** Recognise the need for updating knowledge and upgrading technical skills to meet the current professional development. Self-motivate and enhance entrepreneurship skills for career development in technology for cardiac health care services.

### 18. Programme Goal

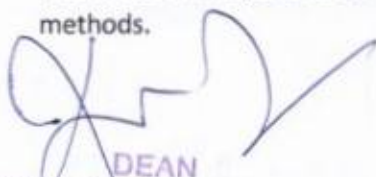
The Programme acts as a foundation degree and helps to develop critical, analytical and problem solving skills at first level. The foundation degree makes the graduates employable in health care organizations and also to assume administrative positions in various types of organizations. With additional qualifications and training help the graduates to pursue a career in academics or scientific organizations as a researcher.

The goals of the Programme include:

- Promote holistic development
- Ability to choose learning trajectories and programmes
- Eliminate harmful hierarchies among disciplines/fields of study and silos between different areas of learning
- Multidisciplinary and holistic education to ensure unity and integrity of knowledge
- Promote creativity and critical thinking to encourage logical decision-making along with appreciating ethical, human & constitutional values
- Promote multilingualism and power of language in learning and teaching
- Impart life skills such as communication, cooperation, teamwork, and resilience
- Facilitate outstanding research as a co-requisite for outstanding education and development

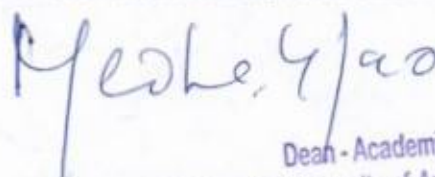
### 19. Programme Educational Objectives (PEOs)

B.Sc. (Hons) in Cardiac Care Technology is an undergraduate degree programme is driven by several compelling rationales, primarily aimed at improving the diagnosis, treatment, and overall management of cardiovascular diseases. Cardiac technologists work alongside physicians to diagnose and treat cardiac (heart) and peripheral vascular (blood vessel) disorders. They play an important role in the management of many cardiac illnesses that need extensive diagnostic and therapeutic methods.



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The objectives of the programme are to enable the students to:

**PEO -1:** Provide students with a strong foundation in Cardiac Care, to enable them to knowledgeable and technically competent cardiac technologist to meet the needs of patient care in cardiac centers & multidisciplinary hospitals.

**PEO -2:** Impart technical skills required to develop innovative solutions as per industry and societal requirements in cardiac care

**PEO-3:** Impart the required managerial and entrepreneurial skills to enable students to work in multidisciplinary cardiac teams and to contribute to the cardiac care needs of the society.

**PEO -4:** Instil human values, social, interpersonal and leadership skills required for professional success involving as global professionals.

## 20. Programme Specific Outcomes (PSOs)

At the end of the **B.Sc. (Hons) Cardiac Care Technology** Programme the graduate will be able to:

**PSO-1:** Apply knowledge and skills of cardiac care to provide safe and effective care to the patients for achieving professional excellence.

**PSO-2:** Adapt to the technological advancement in cardiac care by upgrading to the latest practices in the field of cardiac care technology.

**PSO-3:** Demonstrate the leadership qualities and strive for the betterment of organization, environment and society.

**PSO-4:** Demonstrate an understanding of the importance of lifelong learning through professional development, practical training and specialized certifications.

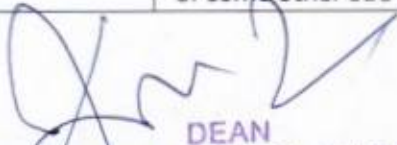
## 21. Program Structure

Course code	Course	T (H/W/S)	Tut (H/W/S)	P (H/W/S)	Total credits	Marks
<b>Semester 1</b>						
AHD101A	General Anatomy	2	0	2	3	100
AHD102A	General Physiology	2	0	2	3	100
AHD103A	HCDS	2	0	0	2	50
AHD104A	General Microbiology	2	0	2	3	100
AHD106A	Basic Electrical and Electronics	2	0	2	3	100
AHD105A	Applied Physics	2	0	2	3	100
	Language – 1 (1)	3	0	0	3	100
AHM101A	Digital fluency	1	0	2	2	50
	<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>12</b>	<b>22</b>	<b>700</b>
	<b>Total number of contact hours per week</b>	<b>28Hrs</b>				
<b>Semester 2</b>						
AHD107A	General Biochemistry	2	0	0	2	50

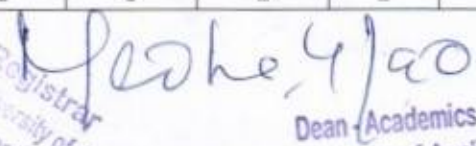
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AHD108A	General Pharmacology	2	0	0	2	50
AHD109A	Concepts of Hospital infection prevention	2	0	0	2	50
AHD110A	General Pathology	2	0	2	3	100
AHD111A	Environmental Science and Health	2	0	0	2	50
AHD113A	Health & wellness	0	0	2	2	50
AHD112A	Early Clinical Education	0	0	20	10	100
	TOTAL	10	0	24	23	450
	<b>Total number of contact hours per week</b>	<b>34 Hrs</b>				
<b>Semester 3</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCC201A	Basic concepts of cardiac Care Technology	2	2	2	4	100
CCC202A	Clinical cardiology	2	2	2	4	100
	Open Electives -1	2	0	0	2	50
AHN202A	Language – 2 (3)	3	0	0	3	100
AHM203A	SEC-2: AI or some other SEC	1	0	2	2	50
AHM204A	Entrepreneurship	1	0	2	3	100
CCC203A	Studentship ( Directed Clinical Education) 1	0	0	12	6	100
	TOTAL	11	4	20	24	600
	<b>Total number of contact hours per week</b>	<b>35 Hrs</b>				
<b>Semester 4</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCC204A	Cardiac Evaluation & therapies –I	2	2	2	4	100
CCC205A	Applied cardiac care technology -I	2	2	2	4	100
	Open Electives -2	2	0	0	2	50
AHN203A	Constitution of India	2	0	0	2	50
AHN204A	SEC-3: Professional communication	1	0	2	2	50
AHN206A	NCC/NSS/R&R(S&G)/ Cultural	0	0	2	1	50
CCC206	Studentship ( Directed Clinical Education) 2	0	0	10	08	100
AHN307A	Ethics & self awareness	1	0	2	2	50
		9	4	20	24	550
	<b>Total number of contact hours per week</b>	<b>34 Hrs</b>				
<b>Semester 5</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCC301A	Cardiac Evaluation & therapies –II	2	2	2	4	100
CCC302A	Applied cardiac care technology –II	2	2	2	4	100
AHM306A	SEC-4: Cyber Security or some other SEC	1	0	2	2	50

  
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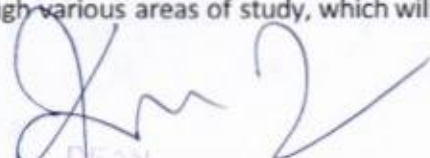


AHN305A	Project Management	2	0	2	2	50
AHN205A	Sports	1	0	2	2	50
CCC303A	Studentship ( Directed Clinical Education) 3	0	0	20	10	100
	TOTAL	8	4	30	24	450
	<b>Total number of contact hours per week</b>	<b>42 HRS</b>				
<b>Semester 6</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCC304A	Nuclear cardiology	2	2	2	4	100
CCC305A	Advanced cardiac care technology	2	2	2	4	100
CCC306A	Research Methodology	3	0	0	3	50
AHN308A	SEC-4: Personality Development and Soft Skill	1	0	2	2	50
CCC307A	Studentship ( Directed Clinical Education 4)	0	0	20	10	100
	TOTAL	8	4	26	23	400
	<b>Total number of contact hours per week</b>	<b>38 Hrs</b>				
<b>Semester 7</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCP401A	Research Project	0	0	20	10	100
CCI401A	Internship	0	0	20	10	100
		0	0	40	20	200
	<b>Total number of contact hours per week</b>	<b>40Hrs</b>				
<b>Semester 8</b>		<b>T (H/W/S)</b>	<b>Tut (H/W/S)</b>	<b>P (H/W/S)</b>	<b>Total credits</b>	<b>Marks</b>
CCP402A	Research Project	0	0	20	10	100
CCIA402A	Internship	0	0	20	10	100
		0	0	40	20	200
	<b>Total number of contact hours per week</b>	<b>40Hrs</b>				
<b>Maximum Marks</b>		<b>3550 (700+450+600+550+450+400+200+200)</b>				
<b>Total Credits</b>		<b>180(22+23+24+24+24+23+20+20)</b>				

## 22. Ability and Skill Enhancement Courses

### • Ability Enhancement Compulsory Courses (AECC)

AECC courses are the courses based upon the content that leads to knowledge enhancement through various areas of study, which will be mandatory for all disciplines:

  
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1. Language and Literature
2. Environmental Science and Sustainable Development/ Environmental Studies
3. Constitution of India and Human Rights, Human rights
4. Project Management
5. Competitive Exam Training

• **Skill Enhancement Courses (SEC)/ Vocational Courses:** These are skill-based courses in all disciplines and are aimed at providing hands-on-training, competencies, skills, etc. SEC courses may be chosen from the pool of courses designed to provide skill-based instruction:

1. Digital Fluency
2. Artificial Intelligence & ML
3. Cyber Security
4. Professional Communication
5. Industry visit/ Vocational Course
6. Internship/training
7. Innovation and Entrepreneurship

• **Value Added courses:** These courses are value-based courses which are meant to inculcate ethics, culture, soft skills, sports education and such similar values to students which will help in all round development of students.

1. Health & Wellness/ Social & Emotional Learning
2. Sports/ Yoga/NCC/NSS
3. Ethics & Self Aware-ness

• **Open Elective Courses:**

A number of Open Elective Courses from various Faculties of RUAS are offered as mentioned in the University's website. Students can choose the Open Electives of their choice. The students are permitted to choose online electives from the list approved by the respective HoD and Dean.

• **Innovation Courses in Lieu of Open Elective Courses**

Students can earn 3-credits by participating in innovation activities as per the approved guidelines in lieu of Open Elective Courses. The activities could be related to any of the following:

- a) Design Thinking and Innovation
- b) Skill Development
- c) Industrial Problem Solving and Hackathons

23. **Course Delivery:** As per the Timetable

24. **Teaching and Learning Methods**

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory work/Field work/Workshop

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6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Work 10. Project 11. Exhibitions 12. Technical Festivals

25. Assessment and Grading (Subject to endorsement of revised unified academic regulations for 2022-23- report submitted)

#### 24.1 Components of Grading

There shall be **two components** of grading in the assessment of each course:

**Component 1, Continuous Evaluation (CE):** This component involves multiple subcomponents (SC1, SC2, etc.) of learning and experiential assessment. The assessment of the subcomponents of CE is conducted during the semester at regular intervals. This subcomponent represents the formative assessment of students' learning.

**Component 2, Semester-end Examination (SEE):** This component represents the summative assessment carried out in the form an examination conducted at the end of the semester.

Marks obtained CE and SEE components have 60:40 weightage (CE: 60% and SEE: 40%) in determining the final marks obtained by a student in a Course.

The complete details of Grading are given in the Academic Regulations.

#### 24.2 Continuous Evaluation Policies

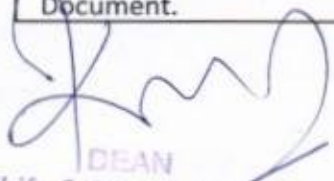
Continuous evaluation depends on the type of the course as discussed below:

##### 24.1.1 Theory Courses

For Theory Courses Only			
Focus of COs on each Component or Subcomponent of Evaluation			
Subcomponent Type	Component 1: CE (60% Weightage)		Component 2: SEE (40% Weightage)
	Terms Tests	Assignments	
CO-1			
CO-2			
CO-3			
CO-4			
CO-5			
CO-6			

The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.

  
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- CE components should have a mix of term tests, quiz and assignments
- Two Tests (15 each), Two Assignments (20 marks). (One written and another to be MCQs)
- Course leaders to declare the assessment components before the commencement of the session and get approval from HoD and Dean

#### 4.1.2 Laboratory Course

For a laboratory course, the scheme for determining the CE marks is as under:

For Laboratory Courses Only			
Focus of COs on each Component or Subcomponent of Evaluation			
	Component 1: CE (60% Weightage)		Component 2: SEE (40% Weightage)
Subcomponent Type	Conduct of Experiments	Laboratory Report + Viva	Laboratory SEE
CO-1			
CO-2			
CO-3			
CO-4			
CO-5			
CO-6			
The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document			

The subcomponents can be of any of the following types:

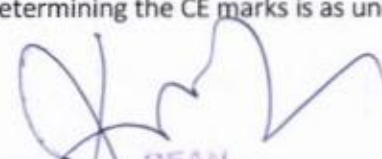
- Laboratory / Clinical Work Record
- Experiments
- Computer Simulations
- Creative Submission
- Virtual Labs
- Viva / Oral Exam
- Lab Manual Report
- Any other (e.g. combinations)

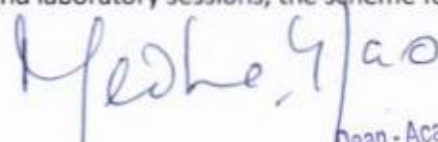
  
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 Director  
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Course leaders to declare the assessment components before the commencement of the session and get approval from HoD and Dean

#### 24.1.3 Course Having a Combination of Theory and Laboratory

For a course that contains the combination of theory and laboratory sessions, the scheme for determining the CE marks is as under:

  
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For Combined Courses (Theory + Laboratory)					
Focus of COs on each Component or Subcomponent of Evaluation					
Course Outcome	CE (Weightage: 60 %) Four components including one Lab component			SEE (Weightage: 25 %)	Lab (Weightage: 15 %)
	Tests (30 %)	Written Assignments+Lab (20 %)	Assignment +Lab CE (10%)	Written exam	LSEE : SEE
CO-1					
CO-2					
CO-3					
CO-4					
CO-5					
CO-6					

The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.

- CE components should have a mix of term tests, quiz and assignments
- Two Tests (15 each), Two Assignments (20 marks). (One written and another to be MCQs)
- In case of courses where laboratory is combined with theory, laboratory components to be assessed in both CE and SEE
- Course leaders to declare the assessment components before the commencement of the session and get approval from HOD and Dean.



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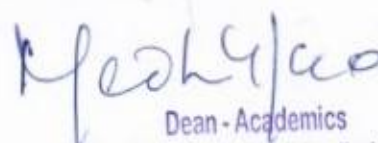
#### 24.1.4 Ability Enhancement courses

For AECC Only		
Focus of COs on each Component or Subcomponent of Evaluation		
	Component 1: CE (60% Weightage)	Component 2: SEE (40% Weightage)



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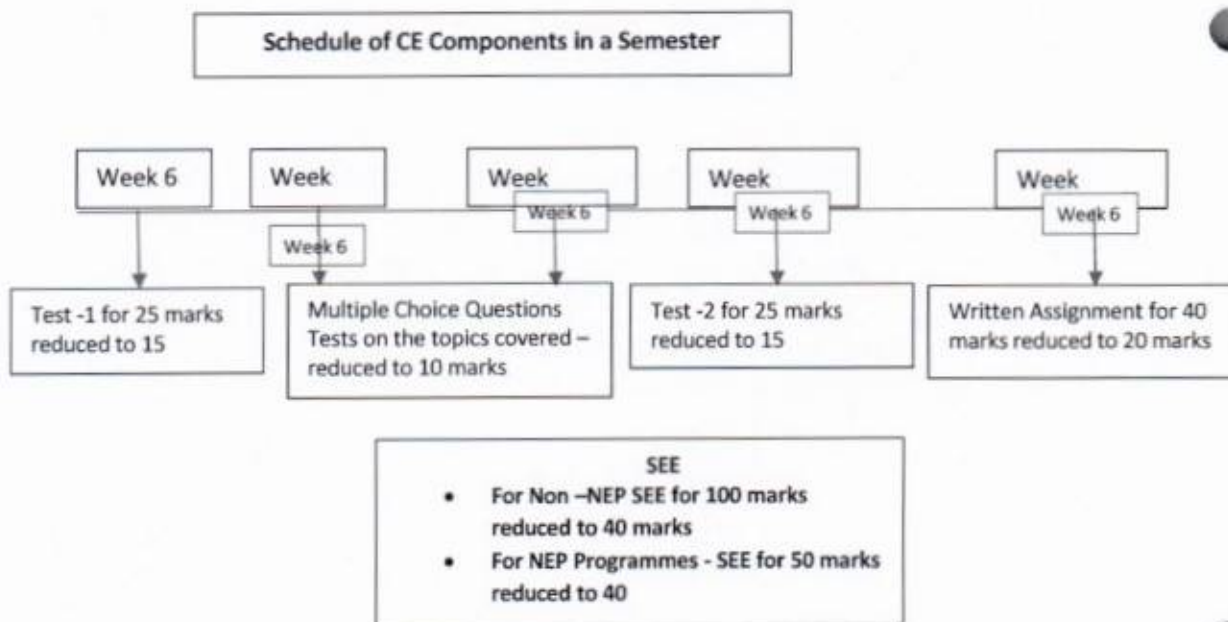
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Subcomponent Type	Terms Tests or Assignments
CO-1	
CO-2	
CO-3	
CO-4	
CO-5	
CO-6	

The details of number of tests and assignments to be conducted are presented in the Academic Regulations and Programme Specifications Document.

- Course leaders to declare the assessment components before the commencement of the session and get approval from HoD and Dean



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Sem	Course Title	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
1	General Anatomy	3	1	2			1					3	3
1	General Physiology	2		1	1	1				2			
1	Health Care Delivery Systems of India	1	1	1	2	1		2	1	2			1
1	General Microbiology		2	1		2	2	2	1	2		1	1
1	Basic Electrical and Electronics												
1	Applied Physics												
1	Language-1 (English)	2	2	1	2	2			1	2			1
1	Digital Fluency/Basic Algorithm and Programming	1		1		2			1	2			1
2	General Biochemistry	3	1	1		2				3			
2	General Pharmacology	2			2	2			1	3			1
2	Concepts of Hospital infection prevention	1	1	2	2	2	1	2	1	2		1	1
2	General Pathology	2		1	1	2			1	2		1	
2	Environmental studies and Health												
2	Health and Wellness												
2	Early Clinical Education	3	1	1		3	1		1	3		1	
3	Basic concepts of cardiac Care Technology	3				1				2			
3	Clinical cardiology	3				2				1			
3	Open Electives -1												
3	Language – 2 (3)												
3	SEC-2: AI or some other SEC												
3	Entrepreneurship												
3	Studentship ( Directed Clinical Education) 1					3	1					2	
4	Cardiac Evaluation & therapies -I	3				2				1			
4	Applied cardiac care technology -I	3				1				2			
4	Open Electives -2												
4	Constitution of India												
4	SEC-3: Professional communication												
4	Sports												
4	NCC/NSS/R&R(S&G)/ Cultural												
4	Directed Clinical Education -2					3	1					2	
5	Cardiac Evaluation & therapies -II	3				2				1			
5	Applied cardiac care technology - II	3				1				2			
5	SEC-4: Cyber Security or some other SEC												

5	Project Management												
5	Ethics & self-awareness												
5	Studentship ( Directed Clinical Education) 3				3	1						2	
6	Nuclear Cardiology	3			1					2			
6	Advanced cardiac care technology	3			2					2			
6	Research Methodology												
6	SEC-4: Personality Development and Soft Skill												
6	Studentship ( Directed Clinical Education) 4				3	1						2	
7	Research Project												
7	Internship												
8	Research Project												
8	Internship												

After all the subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 90 minutes theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

#### 26. Student Support for Learning

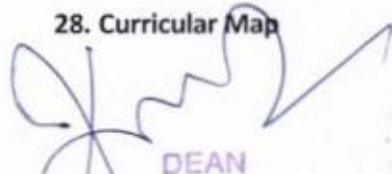
1. Course Notes
2. Reference Books in the Library
3. Magazines and Journals
4. Internet Facility
5. Computing Facility
6. Laboratory Facility
7. Staff Support

#### 27. Quality Control Measures

1. Review of Course Notes
2. Review of Question Papers and Assignment Questions
3. Student Feedback
4. Moderation of Assessed Work
5. Opportunities for students to see their assessed work
6. Review by external examiners and external examiners reports
7. Staff Student Consultative Committee meetings
8. Student exit feedback
9. Subject Assessment Board (SAB)
8. Programme Assessment Board (PAB)

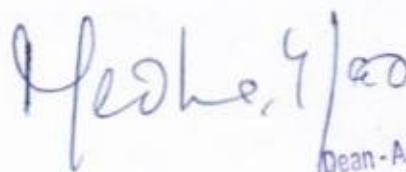
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#### 28. Curricular Map



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**29. Co-curricular Activities**

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposia, paper writing, attending industry exhibitions, project competitions and related activities for enhancing their knowledge and networking.

**30. Cultural and Literary Activities**

Annual cultural festivals are held to showcase the creative talents in students. They are involved in planning and organizing the activities.

**31. Sports and Athletics**

Students are encouraged to take part in sports and athletic events regularly. Annual sports meet will be held to demonstrate sportsmanship and competitive spirit

  
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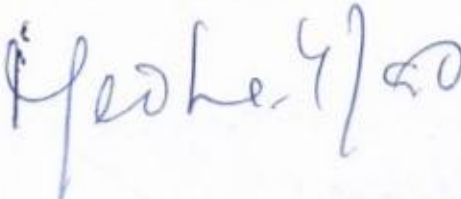
# Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2026




## B.Sc. (Hons) – Cardiac Care Technology 2022-2026

### SEMESTER 1

  
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### Course Specifications : General Anatomy

Course Title	General Anatomy
Course Code	AHD 101A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### 1. Course Summary

The course aims to impart basic knowledge of general human anatomy which forms the basis for understanding other related subjects such as physiology, pathology and surgery. Emphasis will be placed on cell structure and functions. The various basic tissues of the body, their structure and functional co-relation will be taught. Formation of gametes and early development of the human fetus will be dealt with in short. Various organ systems, their components and basic functions will be covered under this course.

#### 2. Course Size and Credits:

Number of Credits	3
Total Hours of Classroom Interaction	30
Number of laboratory Hours	15
Number of Semester Weeks	16
Department Responsible	Allied Health Sciences
Course Marks	100
Pass Requirement	As per university regulations
Attendance Requirement	As per university regulations

#### Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

No.	Course outcome
1.	Describe the structure and functional organization of a basic human cell and the normal anatomical positions and planes of the body
2.	Explain the structure and functions of basic tissues
3.	Explain the components of the organ systems and its basic functions
4.	Identify the parts of a compound microscope and differentiate microscopy of basic tissues
5.	Demonstrate the parts and position of bones in the human body and early development of fetus.
6.	Demonstrate the surface anatomy of structures and interpret data obtained from various imaging techniques.

#### 4. Course

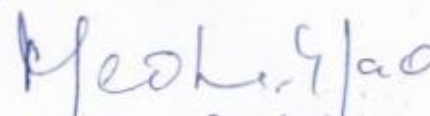
Contents Theory



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**Unit 1: Introduction:** Introduction to the human body as a whole, Anatomical terms, planes and positions, The cell: Structure, function and multiplication

**Unit 2: Tissues:** Types, structure, characteristics, functions, Simple and Compound Epithelium, Connective tissue, Cells, fibers and types, Cartilage, Blood vessels, Muscle, Bone, Nervous tissue, Skin and Salivary Glands

**Unit 3 Embryology:** Fertilization and General embryology

**Unit 4 Osteology:** Axial skeleton (Skull : Cranium, air sinuses, Vertebral column: regions, movements and characteristics, Sternum, Ribs) Appendicular skeleton (Bones involving Shoulder girdle and Upper limb, Pelvic girdle and lower limb, healing of bones: cellular activity, Factors that delay healing, Diseases of bones and joints), Development of bone and stages of ossification

**Unit 5 Organ systems:** Musculoskeletal system, Digestive system, Respiratory system, Circulatory system, Excretory system, Nervous system, Integumentary system, Endocrine system, Lymphoid system

**Unit 6**

Practical:

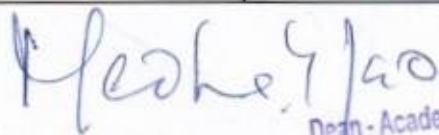
- Histology of epithelium
- Histology of Connective tissue
- Histology of cartilage
- Histology of bone
- Histology of muscle
- Histology of nervous tissue
- Histology of blood vessels
- Histology of skin
- Histology of Salivary glands
- Demonstration of embryology models
- Demonstration of bones Surface anatomy of all organ system
- Interpretation of Radio images

  
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CO-PO PSO Mapping:

	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)
--	--------------------------	------------------------------------

  
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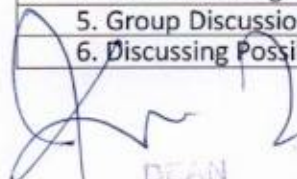
	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8					PSO -1	PSO -2	PSO -3	PSO -4
CO -1		1	2			1										
CO -2		1	2			1										
CO -3	3	1	2			1									3	3
CO -4		1	2			1										
CO -5		1	2			1										
CO -6	3	1	2			1									3	3

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

#### 5. Course Teaching and Learning Methods:

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		14
<b>Demonstrations</b>		
1. Demonstration using Videos		
2. Demonstration using Physical Models/ Systems		
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory	15	15
5. Hospital		
6. Model Studio		
<b>Others</b>		
1. Case Study Presentation	05	
2. Guest Lecture		
3. Industry/Field Visit		16
4. Brain Storming Sessions		
5. Group Discussions	10	
6. Discussing Possible Innovations	01	

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Written Examination (Mid-Term tests and SEE)	10
Total Duration in Hours	55

## 6. Method of Assessment

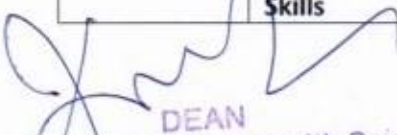
The components and subcomponents of course assessment are presented in the Academic Regulations document pertaining to the Programme. The procedure to determine the final course marks is also presented in the Academic Regulations document as well. The assessment questions are set to test the course learning outcomes. In each component or subcomponent, certain Course Outcomes are assessed as illustrated in the following Table.

Focus of Course Learning Outcomes in each component assessed					
	CE (60% Weightage)			SEE (40% Weightage)	
	SC1 (Term Tests) 30%	SC2 (Innovative + Labassignment) 10%	SC3 (Written+ Lab Assignment) 20%	SEE (Theory) 25%	SEE (Lab) 15%
	(25 + 25 Marks)	10 Marks	40 Marks	50 Marks	30 Marks
CO-1	X	X		X	
CO-2	X	X		X	
CO-3	X		X	X	
CO-4			X	X	
CO-5		X			X
CO-6		X	X		X
CO-7			X		X

## 7. Achieving Course Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
------	------------------------------------	--------------------------------

  
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1	Knowledge	Classroom lectures
2	Understanding	Classroom lectures, self-study
3	Critical Skills	Assignment
4	Analytical Skills	Assignment
5	Problem Solving Skills	Assignment, Examination
6	Practical Skills	Assignment, Examination
7	Group Work	--
8	Self-Learning	Self-study
9	Written Communication Skills	Assignment, examination
10	Verbal Communication Skills	--
11	Presentation Skills	--
12	Behavioral Skills	--
13	Information Management	Assignment
14	Personal Management	--
15	Leadership Skills	--

## 8. Course Resources

### a. Essential Reading

1. BD Chaurasia; 2015; **Handbook of General Anatomy**, 5<sup>th</sup> Edition; CBS Publishing.
2. IB Singh; 2016; **Textbook of Human Histology**, 8<sup>th</sup> Edition; Jaypee Brothers Medical Publishers.
3. IB Singh; 2017; **Human Embryology**, 11<sup>th</sup> Edition; Jaypee Brothers Medical Publishers. General Anatomy and Physiology – by DrVenkatesh
4. Surface and Radiological Anatomy- with a Clinical Perspective- by DrAshwini C A, 1<sup>st</sup> Edition,
5. Jaypee Publishers, New Delhi

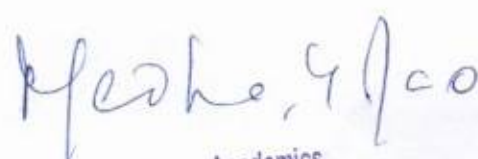
### b. Recommended Reading

1. Anne Waugh, Allison Grant; 2018; Ross & Wilson **Anatomy and Physiology in Health and Illness**, 13<sup>th</sup> edition; Elsevier Churchill Livingstone.
2. Adam W.M. Mitchell, Richard Drake, A. Wayne Vogl; **Gray's anatomy for Students**; 3<sup>rd</sup> edition; Elsevier Churchill Livingstone.

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### Course Specifications : General Physiology

Course Title	General Physiology
Course Code	AHD 102A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### Course Summary

The course aims to impart basic knowledge and sufficient exposure to the physiological concepts and principles with emphasis on applied aspects of organ systems in the body, and to provide the foundations needed for further studies in pharmacology, pathology, pathophysiology and medicine. The mechanisms of deranged function will be appreciated with an in-depth understanding of basic biophysical and physiological mechanisms. The purpose of developing these core competency criteria is to provide guidelines for the breadth and depth of knowledge in the physiological principles and concepts that are considered minimal and essential for further progress in understanding mechanisms of disease and body defenses.

#### 2. Course Size and Credits:

Number of credits	03
Total Hours of Classroom Interaction	30
Number of practical/hours	15
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course Marks	Total Marks: 100
Pass Requirement	As per University regulations
Attendance Requirement	As per University regulations

#### Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After undergoing this course students will be able to:

- CO1. Describe the functions of the organ systems in the body
- CO2. Explain the mechanisms for the execution of these functions for homeostasis through the secretions of chemical and humoral factors
- CO3. Explain the regulatory mechanisms in the control of blood pressure, urine formation maintenance of extracellular and intracellular volume
- CO4. Perform to assess the normal values and parameters of the bodily function indicators such as blood indices, blood gases
- CO5. Demonstrate the tests to assess the functional integrity of the respiratory and cardiovascular system
- CO6. Correlate the disease condition with physiological aspects of bodily functions



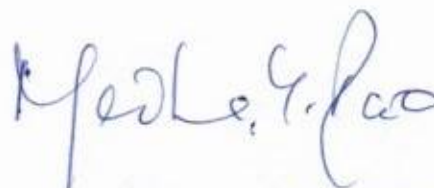
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#### 4. Course Contents

##### THEORY

###### Unit 1: Blood

Composition and function of blood, blood bank, blood transfusion, erythrocyte sedimentation rate (ESR) and packed cell volume, anemia, body fluids.

###### Unit 2: Cardiovascular System

Heart and its muscles, cardiac output, heart sounds, blood pressure, hypertension, ECG.

###### Unit 3: Digestive System

Physiological anatomy of gastro intestinal tract, functions of digestive system, salivary glands structure and functions, deglutition, stomach, gastric secretion, pancreas, functions of liver, gall bladder, intestine and lipids.

###### Unit 4: Respiratory System

Functions of respiratory system, physiological anatomy of respiratory system. Mechanism of normal and rigorous respiration. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. Transportation of respiratory gases lung volumes and capacities, regulation of respiration.

###### Unit 5: Endocrine System

Definition classification of endocrine glands & physiological, anatomy, hormone secreted, physiological function, and their hormones functions of endocrine glands regulation of secretion. Disorders - hypo and hyper secretion of hormone.

###### Unit 6: Nervous system

Functions of nervous system, neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse. Synapse - Structure, types, properties. Receptors and synapses - Definition, classification, properties. Reflex action - Unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, descending tracts - pyramidal tracts - extrapyramidal tracts. Functions of brain EEG. Cerebro spinal fluid (CSF): Formation, circulation, properties, composition and functions lumbar puncture. Autonomic nervous system: sympathetic and parasympathetic distribution and functions and comparison of functions.

###### Unit 7: Excretory System

Functions of kidneys structural and functional unit nephron, vasarecta, cortical and juxtamedullary nephrons: sites of reabsorption, substance reabsorbed, mechanisms of reabsorption glucose, urea, h + Cl amino acids etc. Tmg, tubular lead, renal threshold % of reabsorption of different substances, selective secretion. Properties and composition of normal urine, urine output. Abnormal constituents in urine, mechanism of urine concentration. Counter - current mechanisms: micturition, innervation of bladder, cystometrogram. Diuretics: water, diuretics, osmotic diuretics, artificial kidney renal function tests - plasma clearance actions of Adh, aldosterone and Pth on kidneys. Renal function tests



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### Unit 8: Reproductive System

Function of reproductive system, puberty, male reproductive system. Functions of testes, spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes. Androgens - testosterone structure and functions. Female reproductive system. Ovulation, menstrual cycle. Physiological changes during pregnancy, pregnancy test. Lactation: composition of milk factors controlling lactation.

### Unit 9: Muscle Nerve Physiology

Classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, neuromuscular junction. Transmission across, neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue rigor mortis

### LABORATORY:

1. White Blood Cell Count
2. Red Blood Cell Count
3. Blood Pressure Recording SL
4. Auscultation of Heart Sounds
5. Artificial Respiration SL
6. Pulmonary Function Test

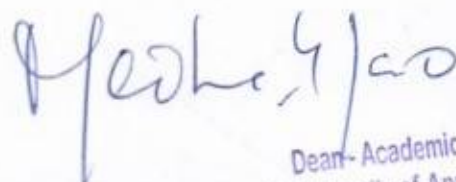
### 5. CO-PO PSO Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2			1					2			
CO-2	2								2			
CO-3	2				1				2			
CO-4	2		1		1				2			
CO-5	2								1			

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

### 6. Course Teaching and Learning Methods:

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		20



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<b>Demonstrations</b>		2
1. Demonstration using Videos	2	
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer	-	
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		30
1. Course Laboratory	25	
2. Computer Laboratory	-	
3. Engineering Workshop/Course Workshop/Kitchen/ OSPE	-	
4. Clinical Laboratory	5	
5. Hospital	-	
6. Model Studio	-	
<b>Others</b>		8
1. Case Study Presentation/ Case Studies	3	
2. Guest Lecture	-	
3. Industry/Field Visit	-	
4. Brain Storming Sessions/ Seminar	6	
5. Small Group Discussions	10	
6. Discussing Possible Innovations	-	
Term Test, Laboratory Examination and Written Examination		10
Total Duration in Hours		70

### 7. Course Assessment and Reassessment

The components and subcomponents of course assessment is presented in the Academic Regulations document pertaining to the programme. The procedure to determine the final course marks is also presented in the Academic Regulations document as well.

The assessment questions are set to test the course learning outcomes. In each component or subcomponent, certain Course Outcomes are assessed as illustrated in the following Table.

Focus of Course Learning Outcomes in each component assessed					
	CE (60% Weightage)			SEE (40% Weightage)	
	SC1 (Term Tests) 30%	SC2 (Innovative + Lab assignment) 10%	SC3 (Written+ Lab Assignment) 20%	SEE (Theory) 25%	SEE (Lab) 15%



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	(25 + 25 Marks)	10 Marks	40 Marks	50 Marks	30 Marks
CO-1	X	X		X	
CO-2	X	X		X	
CO-3	X			X	
CO-4	X		X	X	
CO-5			X	X	
CO-6		X	X		X
CO-7			X		X

### 8. Achieving Course Learning Outcomes

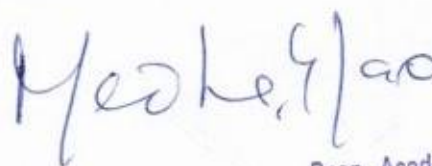
The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
2.	Understanding	Classroom lectures, self-study
3.	Critical Skills	Assignment
4.	Analytical Skills	Assignment
5.	Problem Solving Skills	Assignment, Examination
6.	Practical Skills	Assignment
7.	Group Work	--
8.	Self-Learning	Self-study
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	--
13.	Information Management	Assignment
14.	Personal Management	--
15.	Leadership Skills	--

### 9. Course Resources

#### a. Essential Reading

- Gerard J. Tortora, Bryan H. Derrickson (2013) Principles of Anatomy and Physiology 14th Edition. Wiley publications

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- Kumar Chaudhuri (2011) Concise Medical New Central Book
3. Chatterjee CC(2005) Human Physiology Volume 1 and 2 11<sup>th</sup> edition CBS publishers
  4. D. Venkatesh, H.H. Sudhakar (2015)Textbook of Medical Physiology. Lippincott Williams &Wilkins

**b. Recommended Reading**

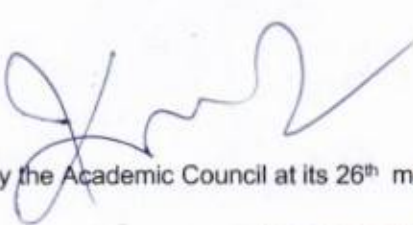
1. Guyton and Hall ( 2016) Textbook of Medical Physiology,
2. 13edition Elsevier's publicationsParveenKumar and Michel Clark (2016) Kumar and Clark's Clinical Medicine Ninth editionGanong's Review of Medical Physiology
3. 24th Edition (LANGE Basic Science) 24th Edition

**c. Magazines and Journals**

**d.Websites**

  
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### Course Specifications : Health Care Delivery Systems of India

Course Title	Health Care Delivery Systems of India
Course Code	AHD 103A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### 1. Course Summary

The aim of the course is to introduce students to the Indian system of health care, health status of the population and initiatives taken at the national level towards improving health status of the population.

The students are oriented to importance of demography and vital statistics and concept of health and disease. The students are exposed to health care delivery systems such as- Siddha, Unani, Homeopathy, Ayurveda and Yoga and Naturopathy. Students are also introduced to concept of integrating health care system to achieve health, measures taken at National level for improving health status of population including National Health programmes.

#### 2. Course Size and Credits:

Number of credits	02
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	0
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50
Pass requirement	As per the academic regulations
Attendance requirement	As per the academic regulations

#### Teaching, Learning and Assessment

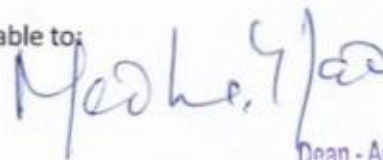
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#### 3. Course Outcomes (CO)

Upon completion of this course students will be able to:

  
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No.	Course outcome
1.	Describe the Health Care delivery system in India at primary, secondary and tertiary level and identify their role in the health care team
2.	Explain the AYUSH system of medicine
3.	Explain the National Health programmes in terms of operation, achievements and constraints
4.	Explain the importance of Demography and Vital statistics in planning health policy
5.	Discuss role of epidemiology and epidemiological methods in health

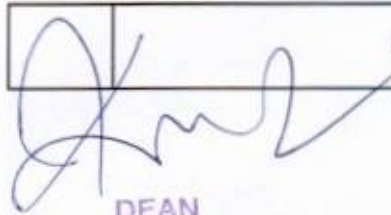
#### 4. Course Contents:

<p><b>Introduction to healthcare delivery system</b></p> <ul style="list-style-type: none"> <li>Healthcare delivery system in India at primary, secondary and tertiary care Community participation in healthcare delivery system</li> <li>Health system in developed countries Private Sector National Health Mission; National Health Policy and issues in health care delivery system in India</li> </ul>
<p><b>National Health Programme</b></p> <ul style="list-style-type: none"> <li>Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme</li> </ul>
<p><b>Introduction to AYUSH system of medicine</b></p> <ul style="list-style-type: none"> <li>Introduction to Ayurveda Yoga, naturopathy, unani, siddha and homeopathy Need for integration of various system of medicine</li> </ul>
<p><b>Health scenario of India- past, present and future</b></p>
<p><b>Demography &amp; Vital Statistics</b></p> <ul style="list-style-type: none"> <li>Demography – its concept. Vital events of life &amp; its impact on demography</li> <li>Significance and recording of vital statistics. Census &amp; its impact on health policy</li> </ul>
<p><b>Epidemiology</b></p> <ul style="list-style-type: none"> <li>Principles of Epidemiology. Natural history of disease</li> <li>Methods of epidemiological studies Epidemiology of communicable &amp; non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance</li> </ul>

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#### 5. Course Map (CO-PO-PSO Map)

Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)
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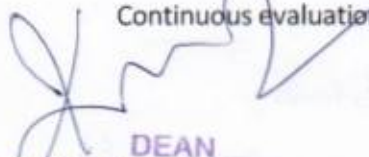
	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8					PSO -1	PSO -2	PSO -3	PSO -4
CO-1		1		2	1		2						2			1
CO-2	1		1										2			
CO-3			1	2	1			1					2			
CO-4		1		1	1		2						2			
CO-5	1			1									2			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																

## 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		25
<b>Demonstrations</b>		
2. Demonstration using Videos		
2. Demonstration using Physical Models/ Systems		
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
<b>Others</b>		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit		05
4. Brain Storming Sessions		
5. Group Discussions	05	
6. Discussing Possible Innovations		
Written Examination (Mid-Term tests and SEE)		05
Total Duration in Hours		35

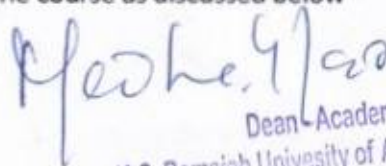
## 7. Method of Assessment

Continuous evaluation depends on the type of the course as discussed below



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Theory Course CE			Theory CourseSEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	40 marks
20 marks	20 Marks	20 Marks	

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- a) Online Test
- b) Assignments/Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other

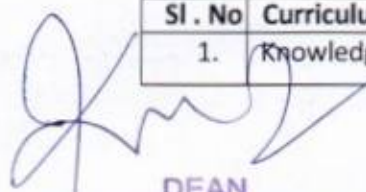
  
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After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl . No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures

  
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2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
14.	Leadership Skills	Group discussions

## 9. Course Resources

### a. Essential Reading

Community Medicine with recent advances - AH Suryakantha - 4th Edition - Jaypee Publishers  
 Review in Community Medicine - VVR SeshuBabu - 2nd Edition - Paras Medical Books  
 Epidemiology for Undergraduates - Marina Rajan Joseph - Jaypee Publishers

### b. Recommended Reading

Park's Textbook of Preventive and Social Medicine - K. Park - 22nd Edition - Bhanot Publishers  
 Oxford Textbook of Public Health - Roger Detels - 5th Edition - Oxford University Press  
 National Health Programs of India - J Kishore - 12th Edition - Century Publications

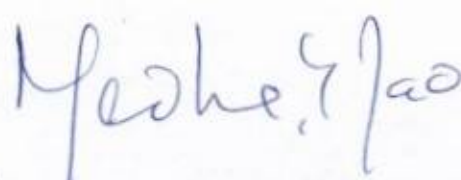
### c. Magazines and Journals

### d. Websites

  
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### Course Specifications : General Microbiology

Course Title	General Microbiology
Course Code	AHD 104A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### 1. Course Summary

This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the Principles & practice of sterilization methods, collection and dispatch of specimens for routine microbiological investigations, interpretation of commonly done bacteriological and serological investigations, and control of hospital infections. This will help the students to maintain sterile working environment and appropriate sample collection.

#### 2. Course Size and Credits

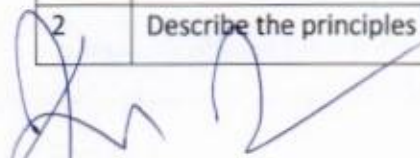
Number of credits	03
Total hours of class room interaction during the semester	30
Number of practical hours	30
Number of semester weeks	16
Department responsible	Allied Health Sciences.
Course marks	Total Marks: 100
Pass requirement	As per the academic regulation
Attendance requirement	As per the academic regulation

#### Teaching, Learning and Assessment

#### 3. Course Outcomes

After undergoing this course students will be able to:

No.	
1	Describe the morphology, physiology and characteristics of microorganisms
2	Describe the principles and practice of sterilization and disinfection

  
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3	Discuss immunology, and immunity
4	Demonstrate sterilization procedures and use of sterilization equipment
5.	Demonstrate Collection and transport of specimens to the laboratory

#### 4. Course Contents

Course Content
<p><b>Introduction to Microbiology</b> History, introduction, scope, aims and objectives. Morphology and physiology of bacteria. Detail account of sterilisation and disinfection. Brief account of culture media and culture techniques. Basic knowledge of selection, collection, transport, processing of clinical specimens and identification of bacteria and drug resistance in bacteria</p>
<p><b>Immunology</b> Infection - Definition, Classification, Source, Mode of transmission and types of Infectious disease. Immunity. Structure and functions of Immune system. The Complement System. Antigen. Immunoglobulins - Antibodies - General structure and the role played in defence mechanism of the body. Immune response. Antigen - Antibody reactions - with reference to clinical utility. And hypersensitivity reactions.</p>
<p><b>Systematic bacteriology</b> Pyogenic cocci - Staphylococcus, Streptococcus, Pneumococcus, Gonococcus, Meningococcus – brief account of each coccus– detailed account of mode of spread, laboratory diagnosis. Mycobacteria - Tuberculosis and Leprosy. Clostridium - Gas gangrene, food poisoning and tetanus. Non-sporing Anaerobes - in brief about classification and morphology, in detail about Viruses: HIV and Hepatitis- Pathogenesis, Lab Diagnosis and management</p>
<p><b>Laboratory:</b> Demonstration of sterilization equipment's: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, L J media, Robertson cooked meat media. Anaerobic culture methods. Antibiotic susceptibility test. Demonstration of common serological tests: ELISA. Demonstration of Grams staining. Demonstration of Acid fast staining. Sample collection methods, storage and transport.</p>

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#### 5. Course mapping

	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)
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	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1								2			
CO-2	2		1		1				2			
CO-3	1		1						2			
CO-4	2				1				2			
CO-5	2	1		2					2			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												

#### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		24
Demonstrations		00
1. Demonstration using Videos	-	
2. Demonstration using Physical Models/Systems	00	
3. Demonstration on a Computer	-	
Numeracy		00
1. Solving Numerical Problems	-	
Practical Work		26
1. Course Laboratory	16	
2. Computer Laboratory	-	
3. Engineering Workshop/Course Workshop/Kitchen	-	
4. Clinical Laboratory	05	
5. Hospital	05	
6. Model Studio	-	
Others		02
1. Case Study Presentation	02	
2. Guest Lecture	-	
3. Industry/Field Visit	-	
4. Brain Storming Sessions	-	
5. Group Discussions	00	
6. Discussing Possible Innovations	-	
Term Test, laboratory and Written Examination		08
Total Duration in Hours		60

#### 7. Method of Assessment

Theory Component CE	Laboratory Component CE	SEE
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SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovativeassignment subcomponents can be of any of the following types:

**Online Test:**

- a) Assignments/Problem Solving
- b) Field Assignment
- c) Open Book Test
- d) Portfolio
- e) Reports
- f) Case Study
- g) Group Task
- h) Laboratory / Clinical Work Record
- i) Computer Simulations
- j) Creative Submission
- k) Virtual Labs
- l) Viva / Oral Exam
- m) Lab Manual Report
- n) Any other



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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

**8. Achieving Learning Outcomes**

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Lecture



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2.	Understanding	lecture
3.	Critical Skills	Assignments, case study discussion, small group discussion
4.	Analytical Skills	Assignments, case study discussion, small group discussion
5.	Problem Solving Skills	Assignments
6.	Practical Skills	-OSPE
7.	Group Work	Assignments
8.	Self-Learning	Assignment, OSPE
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	Small group discussion
11.	Presentation Skills	Small group discussion
12.	Behavioral Skills	-
13.	Information Management	Assignment
14.	Personal Management	-
15.	Leadership Skills	-

#### 9. Course Resources

##### a. Essential Reading

- Class notes
- Ananthnarayan, R. & Panicker, C.K.J., 2009. Textbook of Microbiology. 8<sup>th</sup> ed. Hyderabad: Universities Press (India) Pvt. Ltd.
- Evan Roitt et al, Immunology. 3<sup>rd</sup> ed. USA: McGraw Hill Companies Inc.

##### b. Recommended Reading

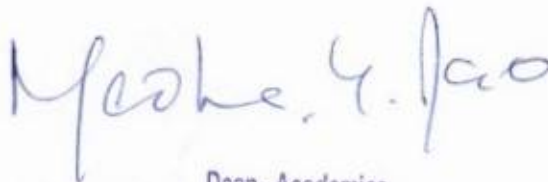
- Apurba S. Sastry & Sandhya Bhat K; Essentials of medical Microbiology. Jaypee. The healthSciences Publisher

##### c. Magazines and Journals

##### d. Websites

  
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### Course Specifications : Basic Electrical & Electronics

Course Title	Basic Electrical & Electronics
Course Code	AHD106A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### 1. Course Summary

##### Aim and summary:

This course deals with basic principles and concepts of Elements of Electrical and Electronics as applied to biomedical instrumentation. Students are taught the fundamentals of circuit analysis, magnetic circuits, DC machines and transformers. In addition, principles of PN junction diode, Zener diode, semiconductor devices such as transistors, amplifiers and power supplies.

#### 2. Course Size and Credits

Number of credits	03
Total hours of class room interaction during the semester	45
Number of tutorial hours	30
Number of semester weeks	16
Department responsible	Electrical and Electronic Engineering
Course marks	Total Mark: 100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

#### Teaching, Learning and Assessment

#### 3. Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1	State various laws of electric and magnetic circuits and explain their significance in biomedical instrumentation
2	Explain DC machines, transformers and their applications

  
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3	Solve simple numerical problems on electric circuits and magnetic circuits,
4	Explain working principles of PN junction diode, Zener diode, transistors and amplifier configurations
5	demonstrate electrical and electronic circuits for hardware modules using standard EDA tool

#### 4. Course Contents

<b>Course Content</b>	
<p><b>DC and AC Fundamentals:</b> Circuit elements, Voltage and Current Division, Ohm's Law and Kirchhoff's Laws, Sinusoidal voltage and currents, concept of cycle period, frequency, peak factor and form factor, phase difference, lagging, leading and in phase quantities. Study of AC circuits of pure R, L and C.</p>	
<p><b>Magnetic Circuits:</b> Magnetic effect of electrical current, Faraday's law of electromagnetic induction, statically and dynamically induced EMF's, self and mutual inductance, concepts of MMF, flux, flux density, reluctance, permeability and field strength, their units and relationship. Simple series and parallel magnetic circuits. Basic analogy between electric and magnetic circuits.</p>	
<p><b>DC Machines and Transformers:</b> Constructional details, working principle and methods of excitation of DC machine as a generator and a motor. Necessity of transformer, Constructional Details (core and shell types), Principle of operation, Ideal Transformer and Practical Transformer. Applications of DC machines and transformers in medical instrumentation.</p>	
<p><b>Basic concepts in Electronics:</b> Semiconductor: p-type, n-type; p-n junction diode, its characteristics, half wave, full wave and bridge type rectifiers, basic filter circuits, Zener diode characteristics, Zener diode as a voltage regulator.</p>	
<p><b>Transistors:</b> Transistor configurations: CB, CE and CC; Transistor parameters: alpha, beta and gamma, working of transistor as a switch, Amplifier, Characteristics of JFET,.</p>	
<p><b>Amplifiers:</b> Differential amplifiers and their transfer characteristics, IC Op-Amps, their ideal and practical characteristics, Op-Amp in different modes as inverting amplifier, non-inverting amplifier, summing amplifier, scale changer, differentiator and integrator.</p>	
<p><b>Lab course</b></p> <p>Design and simulate following circuits using standard EDA tool</p> <ol style="list-style-type: none"> <li>1. Verification of Ohms Law.</li> <li>2. Verification of KVL and KCL</li> <li>3. Verification of series circuit</li> <li>4. Verification of parallel circuits</li> <li>5. Characteristics of p-n junction diode</li> <li>6. Characteristics of Zener diode</li> </ol>	

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7. Half wave rectifier  
Full wave rectifier

### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			2		2			1	2			1
CO-2			2		1				2			
CO-3					2				2			
CO-4			2		1				1			
CO-5					1				1			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												

### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		24
Demonstrations		04
1. Demonstration using Videos	04	
2. Demonstration using Physical Models / Systems	-	
3. Demonstration on a Computer	-	
Numeracy		04
1. Solving Numerical Problems	4	
Practical Work		20
1. Course Laboratory	20	
2. Computer Laboratory	-	
3. Engineering Workshop / Course Workshop / Kitchen		
4. Clinical Laboratory	-	
5. Hospital	-	
6. Model Studio	-	
Others		00
1. Case Study Presentation	-	
2. Guest Lecture	-	

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3. Industry / Field Visit	-
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4. Brain Storming Sessions	-
5. Group Discussions	0
6. Discussing Possible Innovations	-
Term Tests, Laboratory Examination / Written Examination, Presentations	8
Total Duration in Hours	60

### 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

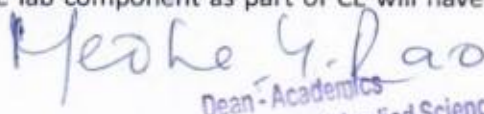
In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- a) Online Test
- p) Assignments/Problem Solving
- q) Field Assignment
- r) Open Book Test
- s) Portfolio
- t) Reports
- u) Case Study
- v) Group Task
- w) Laboratory / Clinical Work Record
- x) Computer Simulations
- y) Creative Submissionaa) Virtual Labs
- bb) Viva / Oral Exam
- cc) Lab Manual Report
- dd) Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have

  
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external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

### Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures, Assignments
2.	Understanding	Class room lectures, Assignments
3.	Critical Skills	Class room lectures, Assignments
4.	Analytical Skills	Class room lectures, Assignments
5.	Problem Solving Skills	Class room lectures, Assignments
6.	Practical Skills	
7.	Group Work	Assignment
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, Examination
10.	Verbal Communication Skills	
11.	Presentation Skills	
12.	Behavioral Skills	Course work
	Information Management	Assignment, Examination
	Personal Management	Course work
15.	Leadership Skills	

### 8. Course Resources

#### a. Essential Reading

- Class Notes
- Edward Hughes, (2002), Electrical and Electronics Technology, ELBS, 6th edition
- Millman and Halkias, (2001) Integrated Electronics, Tata McGraw-Hill Education

#### b. Recommended Reading

- Mittle, V.N., (2007) Basic Electrical and Electronics Engineering, Tata McGraw Hill Edition, New Delhi, 1st edition
- Delton Horn T., (1993) Abraham Pallas, Basic Electricity and Electronics, Europe, McGraw-Hill Limited

#### c. Websites

- Basic Electrical Technology (2013) <http://freevidelectures.com/Course/2335/Basic-Electrical-Technology/23>
- IITM Lectures (2013) <http://www.nptel.iitm.ac.in/courses/108105017/>

#### d. Other Electronic Resources

- Electronic resources on the course area are available on MSRUAS library

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### Course Specifications : Applied Physics

Course Title	Applied Physics
Course Code	AHD105 A
Department	Applied Physics
Faculty	Life and Applied Health Sciences

#### Course Summary

##### 1. Aim and Summary

The aim of this course is to impart basic concepts of Physics and its application to solve medical problems. The students are taught the basic topics in physics which include electromagnetic theory, electricity and magnetism, lasers and fiber optics. Interaction of radiation with matter will be discussed.

##### 2. Course Size and Credits

Number of credits	3
Total hours of class room interaction during the semester	30
Number of Laboratory hours	30
Number of semester weeks	16
Department responsible	Faculty of Mathematical & Physical
Course marks	Total marks: 100
Pass requirement	As per the academic regulations
Attendance requirement	As per the academic regulations

#### Teaching, Learning and Assessment

##### 3. Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1	Explain the basic concepts in sound, electricity and magnetism, laser physics and electromagnetic radiation
2	Describe concepts in optical fibers,

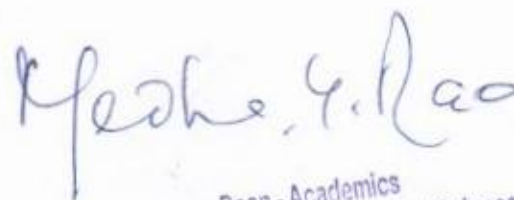


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3	Describe basic properties of fluids
4	Conduct experiments as per the standard procedures and tabulate the measured values
5	Calculate the required parameters and plot the results
6	Interpret, compare with standard results and draw conclusions

#### 4. Course Contents

Course Content
<b>Basic Physics:</b> Sound -The nature and propagation of sound wave (the characteristics of sound, wave theory), speed of sound in a material medium, intensity of sound, the decibel, Interference of sound waves, beats, diffraction, Doppler effect , Applications of Doppler effect
<b>Optical fiber :</b> <b>Basic working principle of optical fibers : Types and structure of Optical fibers, modes of propagation,</b> Refractive index profiles of step index and graded index fibers, Attenuation, Different types of loss mechanisms, Fiber optic application in medical field.
<b>Electricity and Magnetism:</b> A.C. and D.C. power supply with examples, single phase and poly phase power supply, switches, fuses, circuit breakers, earthing etc. main voltage drop: causes and remedy, cables; low tension, high tension. Magnets and magnetic field, force on an electric current in a magnetic field, force on electric charge moving in a magnetic field, Ampere's law, electromagnet and solenoids
<b>Electromagnetic radiation:</b> Electromagnetic radiation spectrum, common properties of electromagnetic radiation; relationship between energy, frequency, wavelength and velocity e.g. X-rays and gamma rays. Transmission through matter, law of exponential attenuation- practical aspects of radiation absorption and transmission through body tissues
Characteristics of laser light, Absorption, spontaneous emission and stimulated emission, Requisite conditions for production of a laser beam, Nd-YAG Laser, Semiconductor laser, Applications of laser to medical field
<b>Fluid mechanics:</b> Rate of flow —lines and tubes of flow—Streamline and turbulent flow— Bernoulli's theorem and its applications-Reynold's number- viscosity —Derivation of Poiseuille's equation —Experimental determination of viscosity of a liquid, Surface tension—capillary rise Diffusion—Fick's law—Graham's law for diffusion of gases, biomedical applications
<b>Basic Physics Laboratory:</b> Study with charts, models & power point presentations- Perform experiments on electricity& magnetism, waves and light radiation. Carry out experiments related to wave properties of light and particle nature of light using laser source. Effect of radiation on matter-inverse square law.

  
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### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			2		2			1	2			1
CO-2			2		1				2			
CO-3					2				2			
CO-4			2		1				1			
CO-5					1				1			
CO-6					2				2			

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		25
<b>Demonstrations</b>		0
1. Demonstration using Videos	3	3
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer	-	
<b>Numeracy</b>		0
1. Solving Numerical Problems	-	0
<b>Practical Work</b>		18
1. Course Laboratory	18	
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen	-	
4. Clinical Laboratory	-	
5. Hospital	-	
6. Model Studio	-	
<b>Others</b>		
1. Case Study Presentation	-	

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2. Guest Lecture	-	6
3. Industry/Field Visit	-	
4. Brain Storming Sessions	-	
5. Group Discussions	6	
6. Discussing Possible Innovations		
Term Tests and Written Examination		
Total Duration in Hours		60

## 7. Method of Assessment

Theory Component CE	Laboratory Component CE			SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- a) Online Test
- b) Assignments/Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative

  
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(Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

## 8. Achieving learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Classroom lectures
	Understanding	Class room lectures,
3.	Critical Skills	Assignment
4.	Analytical Skills	Class room, assignment
5.	Problem Solving Skills	Class room, assignment
6.	Practical Skills	Class room, assignment
7.	Group Work	Classroom
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	--
11.	Presentation Skills	--
12.	Behavioral Skills	Course work
13.	Information Management	Assignment, examination
14.	Personal Management	Assignment, examination
15.	Leadership Skills	--


## 9. Course Resources


### a. Essential Reading

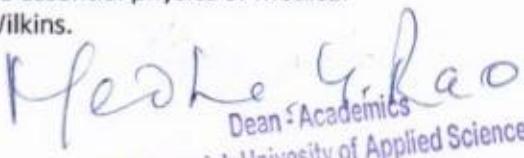
- Class notes
- David Halliday, Robert Resnick and Jearl Walker, (2013) *Fundamentals of Physics*, New York, John Wiley & Sons.
- Murugesan, R., (2008) *Electricity and Magnetism*, 7<sup>th</sup> Edition, S. Chand and Company
- Arora, C. L., (2007) *B.Sc. Practical Physics*, S. Chand and Company Ltd.
- William E. J McKinney Radiographic latent image processing – American Society for Nondestructive Testing (1982)
- W. J. Meredith & J.B. Massey. *Fundamental Physics of Radiology* 1992 (Varghese Publishing House).
- Robin J. Wilks, *Principles of Radiological Physics*, 2nd Revised edition (Oct. 1987) Churchill Livingstone;
- George A. Hay, Donald J. Hughes *First-year Physics for Radiographers* 3rd Revised edition (1997) Bailliere Tindall;

### b. Recommended reading

- Basic Medical Radiation physics – by L Stanton Stanton 1963 (Butterworth)
- Thomas S. Curry III James E. Dowdey, Robert E. Murry Jr. *Christensen's Physics of Diagnostic Radiology* Fourth Edition LWW (August 1, 1990)
- Thayalan, K., (2003) *Basic Radiological Physics*, New Delhi, Jaypee Brothers Medical Publishing Pvt. Ltd.
- Bushberg, Seibert, Leidholdt and Boone, (2002) *The essential physics of Medical Imaging*, North America, Lippincott Williams and Wilkins.

  
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- c. Magazines and Journals: -
- d. Websites
  - [www.ocw.mit.edu/courses/physics](http://www.ocw.mit.edu/courses/physics)
- e. Other Electronic Resources
  - <http://nptel.ac.in/>

Programme Structure and Course Details of B.Sc. (Hons) in Cardiac Care Technology 2022-2023

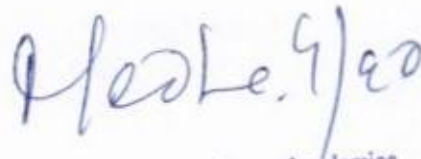


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2022-2023**

**SEMESTER 2**

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## Course Specifications : General Biochemistry

Course Title	General Biochemistry
Course Code	AHD 107A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

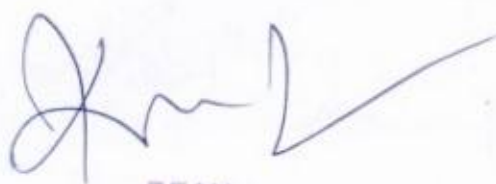
### 1. Course Summary

#### Aim and Summary

The course aims to impart basic knowledge on biochemistry and its role in health and diseases, emphasizing on the diagnostic aspect of the subject. The course is designed to provide an understanding of the basic process of life in molecular terms. The students are oriented to chemistry of carbohydrates, proteins, lipids, and various metabolic pathways to understand and utilize different biomolecules, nutrition, and nutritional support with special emphasis on parental nutrition. Students learn about specimen collection, and different laboratory apparatus used and preparation of solutions. They are exposed to the concept of quality control. They will perform routine urine and blood investigations and interpret and diagnose abnormalities.

### 2. Course Size and Credits:

Number of credits	02
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	00
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations



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**Teaching, Learning and Assessment**

**3. Course Outcomes (CO)**

Upon completion of this course students will be able to:

No.	Course outcome
1.	Describe the various laboratory apparatus used, the steps in specimen collection and safety measurements to be taken in biochemistry laboratory
2.	Explain different models of atomic structure, acids, bases, buffers and disturbances in acid base balance
3.	Explain quality control, precision, specificity, sensitivity when conducting special investigations
4.	Demonstrate qualitative and quantitative estimations of various analyses (urine, blood)
5.	Interpret the various biochemical parameters in health and disease

**4. Course Contents:**

<p><b>Specimen collection</b> Pre-analytical variables. Collection of blood. Collection of CSF &amp; other fluids. Urine collection. Use of preservatives. Anticoagulants.</p>
<p><b>Introduction to laboratory apparatus</b> Pipettes: different types (graduated, volumetric, Pasteur, automatic etc. Calibration of glass pipettes. Burettes, beakers, petri dishes, depression plates. Flasks: different types (volumetric, round bottomed, Erlenmeyer conical etc.). Funnels: different types (conical, Buchner etc.). Bottles: reagent bottles – graduated and common, wash bottles different type specimen bottles</p>
<p><b>Instruments</b> Use, care and maintenance of: water bath, oven &amp; incubators, water distillation plant, water deionizers, refrigerators, cold box, deep freezers, reflux condenser, centrifuge, balances, colorimeter, spectrophotometer, pH meter and electrodes. Centrifuges: definition, principles, Svedberg unit, centrifugal force, centrifugal field, RPM, conversion of G to RPM and vice versa, different types of centrifuges. Manual balances: single pan, double pan, triple balance, direct read out electrical balances.</p>
<p><b>Safety of measurements &amp; Conventional and SI units</b></p>
<p><b>Dilutions</b></p>
<p><b>Acids &amp; Bases</b></p>
<p><b>Acid- base indicator Theory</b></p>
<p><b>Quality control</b></p>

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**5. Course Map (CO-PO-PSO Map) 54**



	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PSO -1	PSO -2	PSO -3	PSO -4
CO-1		1	1		2					2		
CO-2					2					2		
CO-3	1				2					2		
CO-4	2				2					3		
CO-5	2				2					2		
CO-6	3				2					2		

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

## 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		25
Demonstrations		
3. Demonstration using Videos	05	
2. Demonstration using Physical Models/Systems		0
3. Demonstration on a Computer		5
Numeracy		
1. Solving Numerical Problems		
Practical Work		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
Written Examination (Mid-Term tests and SEE)		05

Total Duration in Hours	35
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## 7. Method of Assessment

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Theory Course CE			Theory Course SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	40 marks
20 marks	20 Marks	20 Marks	

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- a) Online Test
- b) Assignments/Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions



14.	Leadership Skills	Group discussions
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## 9. Course Resources

### a. Essential Reading

- Vasudevan, D.M., Sreekumari, S., Vaidyanathan, K. Textbook of Biochemistry for Medical Students, Jaypee Brothers Medical Publishers, New Delhi, 8th Ed, 2016
- Satyanarayana U, Chakrapani U. Biochemistry. Books & Allied (P) Ltd, Kolkata 4th Ed, 2013

### b. Recommended Reading

- Murray Rk, Granner Dk, Rohwell Vw. Harper's Illustrated Biochemistry, Lange McGraw Hill, New York, 30th Ed, 2015
- Champe Pc, Harvey Ra, Ferrier Dr. Lippincott's Illustrated Reviews Biochemistry, Wolters Kluwer Health, Lippincott's Williams & Wilkins, New Delhi, 6th Ed, 2013
- DasDebjyoti, Fundamentals of Biochemistry books & allied, Kolkata 14th Ed, 2012
- Varley, Clinical chemistry 4th edition
- Teitz, Fundamentals of clinical chemistry 6th edition

### c. Magazines and Journals

- Journal of clinical chemistry and laboratory medicine
- Indian journal of medical biochemistry

### d. Websites

## 10. Course Organization

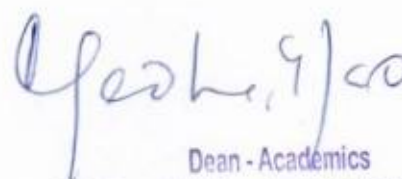
Course Title	General Biochemistry	
Course Code	19AHG111A	
Course Leader/s Name		
Course Leader Contact Details	Phone:	080 - 49065555
	E-mail:	
Course Specifications Approval	June 2022	
Next Course Specifications Review	June 2026	

  
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### Course Specifications : General Pharmacology

Course Title	General Pharmacology
Course Code	AHD108A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### 1. Course Summary:

##### Aim and Summary

The aim of the course is to introduce students of allied health sciences to the Pharmacological basis of therapeutics. This should help them to understand therapeutics in management of various diseases.

Pharmacology, the science of drugs, has special reference to the students of allied health sciences. Practice of various technologies involves use of pharmacological agents both for diagnosis and treatment. The students are oriented to importance of pharmacological basis of therapeutic intervention. Broad understanding of pharmacology with emphasis on how human body handles a drug is imperative to these students.

#### 2. Course Size and Credits:

Number of credits	02
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	00
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 50 As per academic regulations
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

  
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## Teaching, Learning and Assessment

### 3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcome
1.	Describe pharmacokinetic principles in relation to drug administration
2.	Explain the concept of pharmacodynamics in relation to drug utilization in Therapeutics
3.	Explain the concept of chemotherapy in relation to infectious diseases
4.	Explain the importance of adverse effects in therapeutics of various drug Usage
5.	Identify drugs dosage forms and posology in management of diseases and calculate doses in various age groups
6.	Interpret the importance of drug combinations with reference to therapeutic index and drug utilization

### 4. Course Contents:

<p><b>General Pharmacology</b> Introduction to pharmacology-various terminologies-sources &amp; routes of drug administration – Absorption &amp; Factors modifying drug absorption – Distribution of drugs – Metabolism: Phase II, - Excretion: routes, modes &amp; kinetics of elimination – Excretion – Mechanism of drug action in brief, synergism &amp; antagonism and Factors modifying drug action – Adverse drug reactions – ADR reporting &amp; monitoring – Drug Interactions</p>
<p><b>Pharmacokinetics</b> Pharmacokinetics and dynamics of drugs acting on Central Nervous System &amp; Respiratory System Introduction to CNS and Neurotransmitters, drugs used in insomnia, Sedatives and hypnotics</p>
<p>Safety and efficacy of drugs acting on Cardio vascular system &amp; blood. Drugs used in Ischemic Heart Disease-nitrates-Calcium channel, immunomodulators , hormones</p>
<p>Drug use in children and geriatric population with reference to antimicrobials.</p>

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### 5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)									Programme Specific Outcomes (PSOs)				
	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8			PSO -1	PSO -2	PSO -3	PSO -4

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CO-1	2			2	2							2		
CO-2	2			1	2							2		
CO-3	2				2							2		
CO-4	3				2			1				3		1
CO-5	2				2			1				2		1
	2			1	1							2		
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution														

### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		25
<b>Demonstrations</b>		05
1. Demonstration using Videos	05	
2. Demonstration using Physical Models/ Systems		
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
<b>Others</b>		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
7. Journal club		
Written Examination (Mid-Term tests and SEE)		05
<b>Total Duration in Hours</b>		35

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### 7. Method of Assessment

 Theory Course CE	Theory Course SEE
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SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	40 marks
20 marks	20 Marks	20 Marks	

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- a) Online Test
- b) Assignments/Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other



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After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions

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12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
15.	Leadership Skills	Group discussions

## 9. Course Resources

### a. Essential Reading

- Essentials of Medical Pharmacology: K.D. Tripathi, 6th edition, Jaypee Publishers
- Medical Pharmacology. S K Shrivastava. Avichal publishing NewDelhi
- Manual of Practical Pharmacology. Avichal Publications.

### b. Recommended Reading

- Lippincott's Illustrated Reviews: Pharmacology, 5th edition, by Richard A. Harvey and Pamela C. Champe, Lippincott Williams & Wilkins Publisher
- Katzung's Basic and Clinical Pharmacology 13th edition. Lange Publication.
- 

### c. Magazines and Journals: -

### d. Websites: -

  
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## 10. Course Organization

Course		General Pharmacology
Course		19AHG112A
Course Leader/s Name		
Course Leader Contact Details	Phone:	080 – 49065555
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

  
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## Course Specifications : Concepts of Hospital infection prevention

Course Title	Concepts of Infection Prevention
Course Code	AHD109A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

#### 1. Aim and Summary

The aim of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement prevention of infection spreading in the health system

The students will be introduced to aspects such as Bio medical waste management and environment safety, Infection prevention and control, Antibiotic Resistance and Disaster preparedness and management.

#### 2. Course Size and Credits:

Number of credits	2
Total hours of class room interaction during the semester	30
Number of practical hours	-
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course marks	Total Marks: 50
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes

After undergoing this course students will be able to:

No.	Course Outcome
1.	Explain the steps involved in infection prevention and control
2.	Understand the working and application of CSSD
3.	Explain the importance of antibiotic resistance in the patient care and ways to prevent it
4.	Apply the concepts of biomedical waste management to ensure clean and hazard free hospital environment

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#### 4. Course Contents

<p><b>Bio medical waste management and environment safety</b>                  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 &amp; methods of disinfection. Modern technology for handling BMW. Use of personal protective equipment (PPE). Monitoring &amp; controlling of cross infection (Protective devices)</p>
<p><b>Infection prevention and control</b>                  Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)]. Prevention &amp; control of common healthcare associated infections. Components of an effective infection control program and Guidelines (NABH and JCI) for Hospital Infection Control. Spill management</p>
<p><b>Antibiotic Resistance</b>                  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. Antimicrobial stewardship- Barriers and opportunities. Tools and models in hospitals.</p>
<p><b>Working of CSSD:</b>                  Understand the concepts of sterilization, disinfection in CSSD, Structure and working of CSSD</p>

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#### 5. Course Mapping

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	Programme Outcomes (POs)								Programme Specific Outcomes(PSOs)				
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4	
CO-1				3			3			3		1	
CO-2				1	3		1			3			
CO-3				1	3		1			3			
CO-4					3		1			3			
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution													

#### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
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<b>FacetoFaceLectures</b>		20	
<b>Demonstrations</b>			
1. Demonstration using Videos	2	2	
2. Demonstration using Physical Models/Systems	-		
3. Demonstration on a Computer	-		
<b>Numeracy</b>			
1. Solving Numerical Problems	-	08	
<b>Practical Work</b>			
1. Course Laboratory	15		
2. Computer Laboratory	-		
3. Engineering Workshop/Course Workshop/Kitchen/ OSPE	-		
4. Clinical Laboratory	5		
5. Hospital	5		
6. Model Studio	-	00	
<b>Others</b>			
1. Case Study Presentation/ Case Studies	2		
2. Guest Lecture	-		
3. Industry/Field Visit	-		
4. Brain Storming Sessions/ Seminar	3		
5. Small Group Discussions(SGD)	10		
6. Discussing Possible Innovations	-	8	
Term Test, Laboratory Examination and Written Examination			
Total Duration in Hours		38	

### 7. Method of Assessment

Theory Course CE			Theory Course SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	40 marks
20 marks	20 Marks	20 Marks	

In CE there shall be three subcomponents of CE (SC1, SC2, and SC3), namely Mid Term; Written Assignment; Innovative assignments. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- Online Test
- Assignments/Problem Solving
- Field Assignment
- Open Book Test
- Portfolio

  
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- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other

After the three subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. The Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% in case of theory courses. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practical. Tutorials and lectures
3.	Critical Skills	Tutorials SGD
4.	Analytical Skills	Practical
5.	Problem Solving Skills	Case studies SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminar SGD
8.	Self-Learning	SDL SGD assignment
9.	Written Communication Skills	Semester exams ,test and assignment
10.	Verbal Communication Skills	Seminar and SGD
11.	Presentation Skills	Seminar
12.	Behavioral Skills	practical
13.	Information Management	assignment
14.	Personal Management	
15.	Leadership Skills	Group discussion

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### 9. Course Resources

#### a. Essential Reading:

- Class notes
- Essentials of Hospital Infection Control by Apurba Shastry

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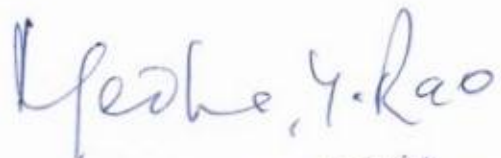
10. Course Organization

Course Code	19AHGXXX		
Course Title	Concepts of Infection Prevention		
Course Leader/Name	As per time table		
Course Leader Contact Details	Phone:	080-45366666	
	E-mail:		
Course Specifications Approval Date	10/5/2019		
Next Course Specifications Review Date:	10/5/2023		

  
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### Course Specifications : General Pathology

Course Title	General Pathology
Course Code	AHD110A
Department	Allied Health Science
Faculty	Faculty of Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

The aim of the course is to introduce students of allied health sciences to concepts of general Pathology. This should help them to build a foundation for understanding pathological basis of various diseases with special reference to radiation technology and dialysis technology. The course would help integrate knowledge of basic concepts of pathology and clinical medicine into allied sciences. At the end of the course, the student will learn fundamental aspects of cellular injury, inflammation, tissue repair, immunology, neoplasia, histopathology, hematology and blood banking

##### 2. Course Size and Credits:

Number of credits	03
Total hours of class room interaction during the semester	30
Number of practical/tutorial hours	15
Number of semester weeks	16
Department responsible	Allied Health Sciences
Course evaluation	Total Marks: 100
Pass requirement	As per academic regulations
Attendance requirement	As per academic regulations

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## II. Teaching, Learning and Assessment

### 3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcome
1.	Describe basic facts and concepts of pathology
2.	Explain fundamental aspects of hematology and blood banking
3.	Explain the various clinical pathology tests
4.	Perform laboratory tests related to hematology and clinical pathology
5.	Interpret the results of laboratory tests
6.	Apply concepts of general pathology to understand pathological basis of Disease

### 4. Course Contents:

#### General Pathology

General Pathology Adaptations, Cell Injury and Repair: Hyperplasia, atrophy, metaplasia, necrosis and apoptosis - Differences between apoptosis and necrosis.

Acute and Chronic inflammation: Five cardinal signs of inflammation- Outcomes of acute inflammation- Chronic inflammation-Granulomatous inflammation- Acute phase proteins. Tissue repair, regeneration and hemodynamic disorders: Cutaneous wound healing- Pathologic aspects of repair-Hyperaemia and congestion-Thrombosis and Virchow triad- Embolism-Infarction Shock; Bronchial asthma, COPD.

Diseases of immune system: Hypersensitivity reaction-Type I, II, III, and IV hypersensitivity reactions.

#### Neoplasia:

Definition of neoplasia. Differences between benign and malignant tumors ; Metastasis ; Carcinogenesis – Causes ; Carcinoma of oral cavity – Causes; Etiology of Carcinoma cervix – type of virus implicated, high risk sero-types, Screening investigations; Breast carcinoma – Risk factors

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**Histopathology**

Introduction to histopathology. Receiving of specimen in the laboratory. Grossing techniques. Mounting techniques: various mountants. Maintenance of records and filing of the slides. Use & care of microscope. Various fixatives, mode of action, preparation and indication. Section cutting. Tissue processing for routine paraffin sections. Decalcification of tissues. Staining of tissues: H & E Staining. Bio-medical waste management. Frozen section cutting and staining.

**Blood Bank**

Introduction. Blood grouping and Rh types. Cross matching

**Laboratory :**

- Urine Examination: physical, chemical, microscopic.
- Blood grouping Rh typing. Cross matching (Observation), how to send samples for cross matching, PT, APTT and Hb, packed cell volume (PCV), erythrocyte sedimentation rate (ESR), bleeding time, clotting time
- Frozen section cutting and H & E staining
- Collection, transport, and preservation, of various clinical specimens. (Urine, CSF, sputum and other body fluids)

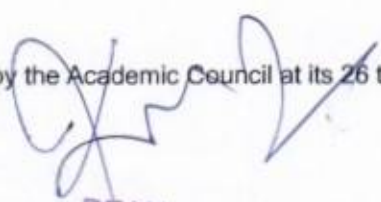
**5. Course Map (CO-PO-PSO Map)**

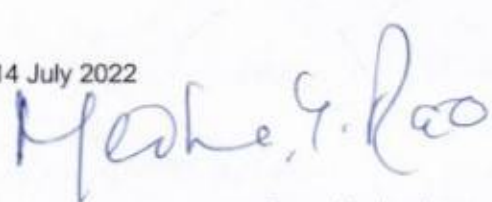
	Programme Outcomes (POs)									Programme Specific Outcomes (PSOs)						
	PO -1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8					PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1				1								2			
CO-2	1		1	1									2			
CO-3	2				2								2			
CO-4	2		1		2								2			
CO-5	2			1									2			
CO-6	2		1		2			1					2		1	

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		25
Demonstrations		
1. Demonstration using Videos		
2. Demonstration using Physical	05	
3. Demonstration on a Computer		
Practical Work		
Conducting demo interviews and focus	15	
Computer lab (software demonstration)		
Demonstrating analysis using a case study		
Others		
1. Case Study Presentation		
2. Brain Storming Sessions		
3. Group Discussions		
4. Discussing Possible Innovations		
Written Examination		10
Total Duration in Hours		55

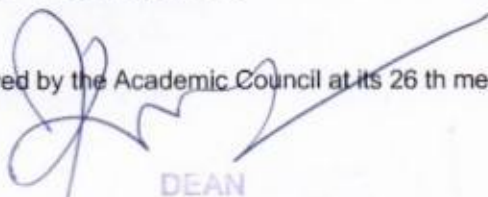
7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

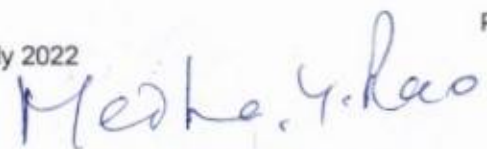
In CE there shall be four subcomponents of CE (SC1, SC2, SC3, and SC4), namely Mid Term; Written Assignment; Innovative assignments; and Laboratory performance assessment. Each subcomponent is evaluated individually accounting to 60% Weightage as indicated in Course Specifications. The innovative assignment subcomponents can be of any of the following types:

- Online Test
- Assignments/Problem Solving
- Field Assignment

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- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Laboratory / Clinical Work Record
- j) Computer Simulations
- k) Creative Submission
- l) Virtual Labs
- m) Viva / Oral Exam
- n) Lab Manual Report
- o) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

#### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S.No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Case study and group discussions
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions
6.	Practical Skills	Case discussions
7.	Group Work	Case study and group discussions
8.	Self-Learning	Assignments/Reports
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions

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11.		Presentation Skills	Case discussions
12.		Behavioral Skills	Group discussion, Case discussions
13.		Information Management	Case discussions
14.		Leadership Skills	Group discussions

## 9. Course Resources

### a. Essential Reading

- Sood R, (1996), Laboratory Technology- Methods and interpretation, 4th Ed. J.P. Bros, New Delhi.
- Nayak R, (2017), Textbook of Pathology for Allied Health sciences, Jaypee brothers Medical Publishers, NewDelhi.
- MdTahmiunur Rahman Sajal et al, (2013), A Short Textbook of Pathology, 2<sup>nd</sup> Ed, Jaypee, NewDelhi

### b. Recommended Reading

- Gupta S, (1998) Short text book of Medical Laboratory for technician, J.P. Bros, New Delhi. Satish M Kawthalkar, (2010), Essentials of Clinical Pathology, Jaypee brothers Medical Publishers, New Delhi.
- Harsh Mohan, (2005), Textbook of Pathology, 5th Ed, Jaypee brothers Medical Publishers, New Delhi.

### c. Magazines and Journals

## 10. Course Organization

Course		General Pathology
Course		19AHG114A
Course Leader/s Name		
Course Leader Contact Details	Phone:	080 – 49065555
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

  
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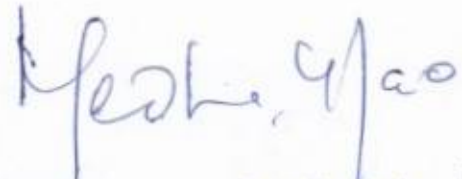
  
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**B.Sc. (Hons) in Cardiac Care Technology  
2022-2026**

**SEMESTER 3**

  
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### Course Specifications : Basic Concepts of Cardiac Care Technology

Course Title	Basic Concepts of Cardiac Care Technology
Course code	CCC201A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

To understand and introduced to the basic concepts of cardiac care technology which includes concepts of non-invasive and invasive diagnostic tests. This course aims at imparting knowledge of basic principles of Electrocardiography, Treadmill Test, Echocardiography and role of Cardiac Catheterization, cathlab equipment personnel and its relevance in diagnosing cardiac pathologies.

##### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Explain the basic principles of ECG, Echocardiography and X- Ray production in cathlab
2.	Describe normal ECG deflections, methods to assess electrical axis & methods to overcome technical artifacts in the ECG
3.	Describe clinical applications of 2D and Doppler ECHO, importance of echo views in diagnosis and types of artifacts in echocardiography

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4.	Explain guidelines for cardiac catheterization, vascular accesses and different contrast media used in cath lab
5.	Perform ECG and interpret given ECG, basic views of 2D echo and identify cardiac structures and importance in diagnosing cardiac pathologies
6.	Demonstrate different knobs on echo machine and explain its importance in image optimization

#### 4. Course Contents

##### Unit – 1 (Electrocardiography)

- Basic Principles of ECG, ECG paper, ECG Machine and its working principle
- Electrical field of the heart – Einthoven's triangle
- ECG Lead System – 12 Conventional leads, posterior leads derivation and its placement
- Basic action of electrocardiograph and recording of an ECG
- Normal ECG deflections: Normal ECG waveforms, Segments and intervals, Preordial pattern of ECG
- Electrical Axis, so called rotation of the heart
- Rate and Rhythm assessment
- Artifacts in ECG

##### Unit – 2 (Exercise Stress Testing)

- Introduction to Treadmill Test – Indications, Contraindications and Safety, equipment and Protocols, termination, complications, basics of Interpretation of the Exercise Test.
- Exercise Testing to Diagnose Obstructive Coronary Artery Disease - Rationale and Guidelines, Pretest Probability (true positive, false positive, true negative and false negative ST-Segment Interpretation, Confounders of Stress ECG Interpretation.
- Result Reporting

##### Unit – 3 (Echocardiography)

- History of Echocardiography
- Principles of Echocardiography: Basic principles of ultrasound, modes of echo – A, B mode, M-mode, 2D echo
- Instrumentation: Basic Pulse Echo System, Transducers, Display and Recording, Knobology
- Doppler Echocardiography: Principles of Doppler echo, types, color flow imaging, clinical applications and image optimization of Doppler echocardiography
- Artifacts – 2D and Doppler artifacts
- Basic transthoracic echo views – Transducer position, orientation and diagnostic information

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- Biological Effects of Ultrasound

#### Unit – 4 (Cardiac Catheterization)

- Cardiac Catheterization Laboratory: Introduction and importance of cathlab, cathlab equipment, how to handle the machine, common problems one may come across and how to overcome it.
- X – Ray theory: Electromagnetic energy, Electromagnetic radiation, Quantum theory and X-ray photons, X-ray tube and X-ray production, Radiation Safety and protocols
- Medical Asepsis: Maintaining sterility and personnel protective equipment's
- Materials used in Cathlab: Catheters, Guide wires & accessories, balloons, stents and all other materials used in cathlab, Contrast Media & radiation dose
- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian, radial and internal jugular approaches

#### Practical Contents

##### Unit - 1

- ECG Machine: parts and maintenance
- ECG lead system – Types and its placement
- Technique of ECG recording
- Interpretation: Rate, rhythm and cardiac axis, morphology of wave forms
- Artifacts – Types and methods to overcome
- TMT – Indications, Contraindications, Importance of Consent, Patient preparation, Procedure, Termination of TMT, Interpretation and complications

##### Unit – 2

- Echocardiography: Echo machine – parts, knobs, preventive maintenance service
- Echo views: transducer selection, patient position, probe manipulation and orientation, Diagnosing normal cardiac structures
- Modes of Echo – principles and role in image optimization
- Doppler Echocardiography – Types, Clinical applications, advantages and disadvantages
- Artifacts – 2D, Doppler artifacts and methods to overcome it
- Biological effects of ultrasound

##### Unit – 3

- Cardiac Catheterization: Cathlab setup, machine – parts, working principle and its importance
- Materials used in cathlab: Catheters, Guidewires & accessories, balloons, stents and all other materials used in cathlab, Contrast Media & radiation dose
- Radiation Safety protocols
- Medical asepsis – maintaining sterility and importance of personnel protective equipments

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- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian, radial and internal jugular approaches

### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3		1						2			
CO-2	3								1			
CO-3	3	1							3	1		1
CO-4	3	1							3	1		1
CO-5	3	1							3	1		1
CO-6	3	1							3	1		1

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7

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Total Duration in Hours	103
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## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- a) Online Test
- b) Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

  
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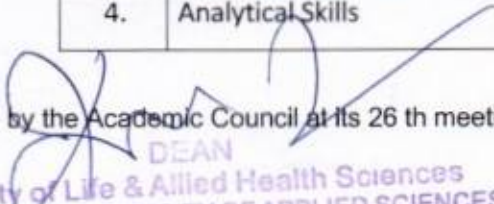
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## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment

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5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

## 9. Course Resources

### a. Essential Reading

- A text book of Electrocardiography –Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7<sup>th</sup> or 8<sup>th</sup> edition
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim
- Class notes

### b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition

### c. Journals:

- Pubmed

### d. Websites:

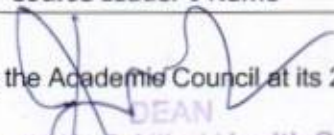
- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

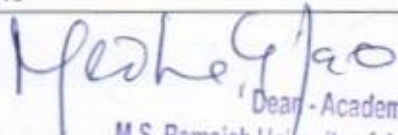
  
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## 10. Course Organization

Course Code	
Course Title	Basic Concepts of Cardiac Care Technology
Course Leader's Name	As per time table

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Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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### Course Specifications : Clinical Cardiology

Course Title	Clinical Cardiology
Course Code	CCC202A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

To understand and describe the clinical examination, heart sounds & murmurs & chest X-ray of cardiac diseases

##### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial & Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Explain the clinical examination of various cardiac diseases
2.	Describe the cardiac and non-cardiac signs and symptoms
3.	Explain the class of severity of cardiac disease based on symptoms
4.	Describe the normal & abnormal Heart Sounds & murmurs
5.	Interpret the chest X-ray findings
6.	Illustrate the diagnosis & care for patients in cardiac diseases

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#### 4. Course Contents

##### Unit – 1

- History taking: NYHA functional class

##### Unit – 2 (Physical Examination: Signs)

- Cyanosis: Definition, Evaluation, Types - Peripheral cyanosis, Central cyanosis, Mixed cyanosis, Differential cyanosis
- Squatting, Hoarseness of voice and Hemoptysis – Etiology, Evaluation
- Pedal Edema – Etiology: Cardiac and noncardiac causes and Evaluation

##### Unit – 3 (Physical Examination: Symptoms)

- Chest pain: Etiology – Cardiac and noncardiac causes, Duration, Radiation, Location, Character, Angina: Chronic stable angina and Unstable angina
- Palpitation: Etiology – Cardiac & Non - Cardiac causes, Evaluation
- Fatigue – Etiology, Evaluation
- Syncope: Etiology – Cardiac & Non - Cardiac causes, Evaluation, Unknown causes
- Dyspnea: Etiology – Cardiac & Non - Cardiac causes, Pathogenesis, Paroxysmal nocturnal dyspnea, Orthopnea, Tachypnea

##### Unit – 4 (Pulse System)

- Arterial Pulse: Definition, Genesis, Pulse wave pattern, Examination of arterial pulse, Abnormalities in pulse volume & character
- Jugular venous pulse: Waves of JVP in normal and abnormal –conditions
- Peripheral Pulses

##### Unit – 5 (Heart Sounds)

- Normal Heart Sounds
- Abnormal heart sounds
- Heart murmurs and its significance in cardiac diseases

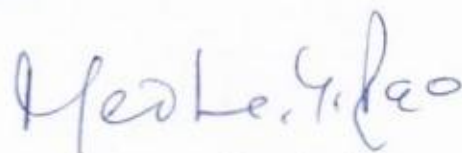
##### Unit – 6 (Chest X – Ray)

- Approach to chest x-ray
- Chest X-ray views and its importance, Patient positioning
- Cardiac Silhouette – identifications of cardiac structures, cardiac borders
- Cardiac chamber enlargement
- Interpretation of altered pulmonary blood flow
- Chest X-ray findings in various heart diseases

  
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**Practicals:**

- History taking
- Physical Examination
- Chest X-Ray: Indications, Patient preparation, Chest x-ray views, Patient positioning, Interpretation, Precautions to be followed

**5. Course Mapping**

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	3							2			
CO-2	3				1				2			
CO-3	3								2	1		
CO-4	3	1							3			
CO-5				3	1					2		
CO-6				3	1					2		

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

**6. Course Teaching and Learning Methods**

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		

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6. Discussing Possible Innovations	-
Term Test, written Exam & Lab Exam	07
Total Duration in Hours	103

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- Online Test
- Problem Solving
- Field Assignment
- Open Book Test
- Portfolio
- Reports
- Case Study
- Group Task
- Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

  
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SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

## 9. Course Resources

### a. Essential Reading

- Braunwald Heart Disease
- Hurts Heart Disease
- Moss & Adams
- Vijay Raghavan
- Alagappans

### b. Recommended Reading

- Class notes

### c. Journals:

- Pubmed

### d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>



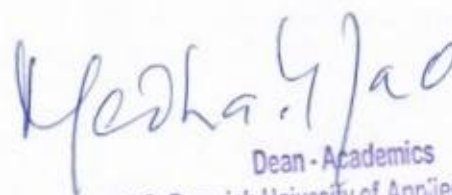
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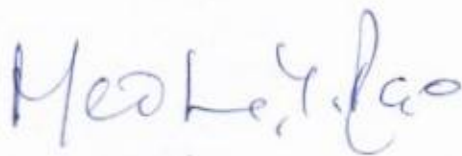
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## 10. Course Organization


Course Code	CCC202A		
Course Title	Clinical Cardiology		
Course Leader's Name	As per time table		
Course Leader Contact Details	Phone:		
	E-mail:		
Course Specifications Approval Date			
Next Course Specifications Review			

  
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## Course Specifications : Entrepreneurship Development

<b>Course Title</b>	Entrepreneurship Development
<b>Course Code</b>	AHM204A
<b>Course Type</b>	Core Theory Course
<b>Department</b>	Management Studies
<b>Faculty</b>	Management and Commerce

### I. Course Summary

#### 1. Aim and Summary

The open elective common course on Entrepreneurship Development has been introduced across all the undergraduate programs with an aim to impart comprehensive knowledge of an entrepreneurial ecosystem. Further, the course enables to develop entrepreneurial skills by building entrepreneurial intentions among students. The students also gain knowledge on competencies to provide with necessary inputs for creation of new ventures and scaling up existing startups. The students are also introduced to design thinking process to nurture entrepreneurial way of thinking.

#### 2. Course Size and Credits:

<b>Number of Credits</b>	03
<b>Credit Structure (Lecture: Tutorial: Practical)</b>	1:1:1
<b>Total Hours of Interaction</b>	
<b>Number of Weeks in a Semester</b>	15
<b>Department Responsible</b>	Respective Department of the Faculty
<b>Total Course Marks</b>	100
<b>Pass Criterion</b>	As per the Academic Regulations
<b>Attendance Requirement</b>	As per the Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course outcome
1.	Discuss the concepts and process of entrepreneurship
2.	Construct and apply the idea generation techniques
3.	Examine the opportunities for launching of new venture and various entry strategies
4.	Acquire the skills for creation and management of entrepreneurial venture
5.	Present a viable business plan, for business success

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#### 4. Course Contents

##### Unit 1: Introduction to Entrepreneurship

Introduction to entrepreneurship, Evolution of the concept, Entrepreneurial process, Types of Entrepreneurship - Social entrepreneurship, rural entrepreneurship. characteristics of an entrepreneur, incorporation of a company, managing a family business, corporate intrapreneurship

##### Unit 2: Creativity and the Business idea):

Key elements in an entrepreneur's background. Types of Innovations. Identify various sources of ideas for new ventures- methods available for generating new venture ideas- creativity, design thinking and the techniques for creative problem solving. Aspects of the product planning and development process

##### Unit 3: New Venture:

Creating opportunities, resources, role of new ventures and small businesses in the economy, types of entry strategies, launch a new venture and the generic strategies

##### Unit 4

##### Strategies to Sustain and Grow

Strategies for expansion, joint ventures, acquisitions, merges, franchising, public issues, rights issues, bonus issues, growth strategy, exit strategy.

##### Unit 5 Business Plan

Business plan, scope and value of the business plan, step-by-step explanation of the business plan, marketing plan, Organizational plan, financial plan (source of capital), entrepreneurship models

  
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#### 5. Course Map (CO-PO-PSO Map)

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2									2			3
CO-2	3	2	2	2	3								3	2	
CO-3	3	3	2	2								2		2	
CO-4	3	2	2	2	2	3			3	3			2		3
CO-5	2	3		2							3		2	3	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

#### 6. Course Teaching and Learning Methods

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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		20
<b>Demonstrations</b>		02
1. Demonstration using Videos	02	
2. Demonstration using Physical Models / Posters	00	
3. Demonstration on a Computer	00	
<b>Numeracy</b>		00
1. Solving Numerical Problems	00	
<b>Practical Work</b>		03
1. Course Laboratory	00	
2. Computer Laboratory	00	
3. Engineering Workshop / Course/Workshop /Kitchen	03	
4. Clinical Laboratory	00	
5. Hospital	00	
6. Model Studio	00	
<b>Others</b>		15
1. Case Study Presentation	05	
2. Guest Lecture	01	
3. Industry / Field Visit	02	
4. Brain Storming Sessions	02	
5. Group Discussions	04	
6. Discussing Possible Innovations	01	
Term Tests, Laboratory Examination/Written Examination, Presentations		05
<b>Total Duration in Hours</b>		<b>45</b>

## 7. Method of Assessment

The details of the components and subcomponents of course assessment are presented in the Program Specifications document pertaining to the UG Program. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1, SC2), COs are assessed as illustrated in the following Table.

Focus of COs on each Component or Subcomponent of Evaluation			
Subcomponent ▶	Component 1: CE (50% Weightage)		Component 2: SEE – Group Task/Activity(50% Weightage)
	SC1	SC2	
Subcomponent Type ▶	Mid Term Test	Assignment/Presentation Deck of Innovative Ideas	50 Marks

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Maximum Marks ▶	25	25	
CO-1	☐		☐
CO-2	☐		☐
CO-3		☐	☐
CO-4		☐	☐
CO-5		☐	☐
The details of SC1 and SC2 are presented in the Programme Specifications Document.			

The Course Leader assigned to the course, shall provide the focus of COs in each component of assessment in the beginning of the semester to capture the Group Task evaluation parameters such as: field visit, presentation of business plan, case study presentation on success and failure companies. Ideating and running the business for a day inside the campus.

Course reassessment policies are presented in the Academic Regulations document.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

S. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Assignment
4.	Analytical Skills	Class room, assignment, examination
5.	Problem Solving Skills	Assignment, Field visit and presentation
6.	Practical Skills	Assignment
7.	Group Work	Case study Presentation
8.	Self-Learning	Assignment
9.	Written Communication Skills	Assignment, examination
10.	Verbal Communication Skills	Case study and group discussions
11.	Presentation Skills	Case study and group discussions
12.	Behavioral Skills	Group discussions
13.	Information Management	Assignment
14.	Personal Management	Assignment and Group Discussion
15.	Leadership Skills	Group discussions and Case study

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### 9. Course Resources

- a. Essential Reading
- Course notes

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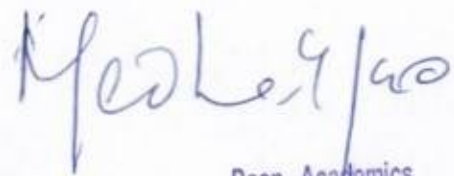
- Rajeev Roy, (2011), *Entrepreneurship*, Oxford University Press, 2nd Edition
  - Robert D. Hisrich, Michael P. Peters, *Entrepreneurship (2017)* Dean A. Shepherd. Tenth edition.
  - New York, NY : McGraw-Hill Education
- b. Recommended Reading**
- Poornima. M. Charantimath, *Entrepreneurship Development (2006)* Small Business Enterprises, Pearson Education
- c. Magazines and Journals**
- Business World: ABP Group - Fortnightly business magazine
  - Journal of small business management , Blackwell publishing- yearly
  - Business Strategy: PwC Strategy& Inc. - Quarterly issue
- d. Websites**
- www. startup India.org
  - www. allsharktankproducts .com
- e. Other Electronic Resources**
- NA

#### 10. Course Organization

Course Code	22MCM201A	
Course Title	Entrepreneurship Development and Startups	
Course Leader's Name	As per Timetable	
Course Leader's Contact Details	Phone:	+91-80-4536-6666
	E-mail:	
Course Specifications Approval Date	17 June 2022	
Next Course Specifications Review Date	June 2024	



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## Course Specifications : Directed Clinical Education - 1

Course Title	CCC203
Course Code	Directed Clinical Education - 1
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

#### 1. Aim and Summary

To learn about the clinical aspects of cardiac care and implement the knowledge in cardiac care technology

#### 2. Course Size and Credits

Number of credits	6
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	256
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course outcome
1.	Outline the clinical & physical examination of cardiac patients
2.	Demonstrate the working principle of ECG, ECHO & Cath lab machine
3.	Discuss the materials used in cath lab
4.	Adapt the Radiation safety protocols in Cath Lab
5.	Analyze the Normal of ECG, TMT & ECHO Reports

#### 4. Course Contents

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### Unit-1

- History taking
- Physical Examination
- Chest X- Ray: Indications, Patient preparation, Chest x-ray views, Patient positioning, Interpretation, Precautions to be followed

### Unit-2

- ECG Machine: parts and maintenance
- ECG lead system – Types and its placement
- Technique of ECG recording
- Interpretation: Rate, rhythm and cardiac axis, morphology of wave forms
- Artifacts – Types and methods to overcome
- TMT – Indications, Contraindications, Importance of Consent, Patient preparation, Procedure, Termination of TMT, Interpretation and complications

### Unit – 3

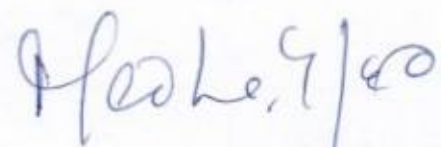
- Echocardiography: Echo machine – parts, knobs, preventive maintenance service
- Echo views: transducer selection, patient position, probe manipulation and orientation, Diagnosing normal cardiac structures
- Modes of Echo – principles and role in image optimization
- Doppler Echocardiography – Types, Clinical applications, advantages and disadvantages
- Artifacts – 2D, Doppler artifacts and methods to overcome it
- Biological effects of ultrasound

### Unit – 4

- Cardiac Catheterization: Cathlab setup, machine – parts, working principle and its importance
- Materials used in cathlab: Catheters, Guidewires & accessories, balloons, stents and all other materials used in cathlab, Contrast Media & radiation dose
- Radiation Safety protocols
- Medical asepsis – maintaining sterility and importance of personnel protective equipments
- Guidelines for diagnostic catheterization, premedication, prerequisites, anaesthesia and sedation, Vascular access – Umbilical, femoral, subclavian, radial and internal jugular approaches

  
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	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			1		3				2			
CO-2			1		3				2			
CO-3			1		3					2		
CO-4			1		3				2			
CO-5			1		3						2	

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

## 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		256
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		256
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		00
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		256

## 7. Method of Assessment

SC1 (Internal Viva)	SC2 (Logbook)
50 Marks	50 Marks

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In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test  
After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100%Weightage.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

### 9. Course Resources

#### a. Essential Reading:

- Braunwald Heart Disease
- Hurts Heart Disease
- Moss & Adams
- Vijay Raghavan
- Alagappans

#### b. Recommended Reading:

- Class notes

#### c. Journals:

- Pubmed

  
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d. Websites:

- ☒ <https://www.onlinejase.com/>
- ☒ <https://academic.oup.com/ehjcmaging>

10. Course Organization

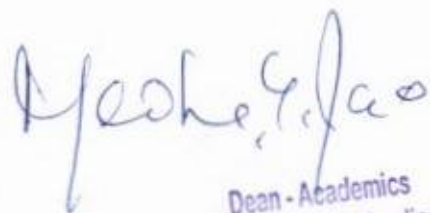
Course Code	CCC203A		
Course Title	Directed Clinical Education -1		
Course Leader's Name	As per time table		
Course Leader Contact Details	Phone:		
	E-mail:		
Course Specifications Approval Date			
Next Course Specifications Review			



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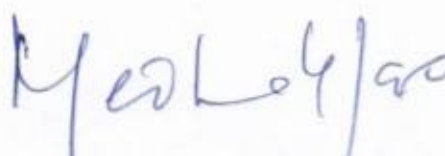
# Programme Structure and Course Details of B.Sc. (Hons) Cardiac Care Technology 2022- 2026



## B.Sc. (Hons) in Cardiac Care Technology 2022- 2026

### SEMESTER 4

  
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## Course Specifications : Cardiac Evaluation and Therapies - I

Course Title	Cardiac Evaluation and Therapies - I
Course Code	CCC204A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

#### 1. Aim and Summary

To understand and describes the basic concepts, pathophysiology, diagnosis & management of coronary, Valvular, cardiomyopathies, Heart failure and peripheral vascular diseases.

#### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Explain the etiology, morphology & classification of various cardiac diseases
2.	Describe the hemodynamics & pathophysiology of heart diseases
3.	Describe the diagnosis & management of cardiac diseases
4.	Explain the Diagnosis, complications & management of peripheral vascular Diseases
5.	Illustrate the clinical & physical examination myocardial infraction, Valvular heartdiseases, Heart failure
6.	Apply theoretical & practical skills to approach heart diseases by ECG & Echocardiography

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#### 4. Course Contents

##### Unit – 1 (Acute Coronary Syndrome)

- Definition
- STEMI, NSTEMI
- Etiology
- Pathophysiology of ACS - Ischemic Cascade
- Clinical Presentation - Unstable Angina, Chronic Stable Angina
- Old Myocardial Infarction – Etiology, Clinical Presentation, Pathophysiology
- Acute MI & Chronic MI, Complications of MI

##### Unit – 2 (Valvular Heart Diseases)

- Rheumatic Fever – Definition, Prevalence, Clinical features, Diagnosis & Management
- Mitral Stenosis - Definition, Etiology, Pathophysiology, Clinical Presentation, Diagnosis & Management
- Aortic Stenosis - Definition, Etiology, Pathophysiology Clinical Presentation, Diagnosis & Management
- Tricuspid Stenosis & Pulmonary Stenosis - Definition, Etiology, Pathophysiology, Clinical Presentation, Diagnosis & Management
- Mitral Regurgitation - Definition, Etiology, Types, Pathophysiology Clinical Presentation, Diagnosis & Management
- Aortic Regurgitation - Definition, Etiology, Types, Pathophysiology Clinical Presentation, Diagnosis & Management
- Tricuspid & Pulmonary Regurgitation - Definition, Etiology, Types, Pathophysiology, Clinical Presentation, Diagnosis & Management

##### Unit – 3 (Cardiomyopathies)

- Introduction, Classification: DCM, HCM & RCM – Etiology, Pathophysiology & Clinical Presentation, Diagnosis & Management
- Infiltrative Cardiomyopathy: Cardiac Amyloidosis, Endomyocardial fibrosis, Sarcoidosis, Storage disorders: Pompe's disease, Fabry's disease
- Other variants in Cardiomyopathy: Peripartum Cardiomyopathy, LV non compaction, Arrhythmogenic RV dysplasia, Takostubo Cardiomyopathy

##### Unit – 4 (Infective Endocarditis)

- Definition, Etiology, Clinical findings, Diagnosis – modified dukes criteria & Management

##### Unit – 5 (Heart Failure)

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation, Diagnosis &

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Management

**Unit – 6 (Shock)**

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation,Diagnosis & Management

**Unit – 7 (Peripheral Vascular Diseases)**

- Definition, Etiology, Classification, Pathophysiology, Clinical Presentation,Diagnosis & Management

**Practicals Content**

- ACS – Clinical Examination, Physical Examination, Diagnosis & Management:clinicaldecision making, timing of surgery
- Valvular Heart Diseases – Clinical Examination, Physical Examination,Diagnosis & Management: clinical decision making, timing of surgery
- Cardiomyopathies – Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery
- Infective Endocarditis, Heart failure, Shock, Peripheral Vascular diseases – ClinicalExamination, Physical Examination, Diagnosis & Management: clinicaldecision making, timing of surgery

**5. Course Mapping**

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			3		2				1			
CO-2			3		2				1			
CO-3			3		2				1			
CO-4			2		3					1		
CO-5			3		1						2	
CO-6			3		1						2	

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

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## 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		
1. Course Laboratory		32
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		
1. Case Study Presentation		32
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, and Class tests		07
<b>Total Duration in Hours</b>		<b>103</b>

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- Online Test
- Problem Solving
- Field Assignment
- Open Book Test

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- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

#### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

#### 9. Course Resources

##### a. Essential Reading

- ECG:
  - Leo Schamroth
  - Mervin Goldmann
  - Marriott's Practical Electrocardiography
- ECHO
  - Braunwald Heart Disease

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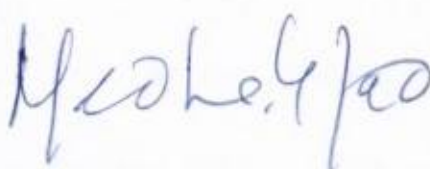
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- Hurts Heart Disease
  - Moss & Adams
- b. **Recommended Reading**
- Class Notes
- c. **Journals:**
- Pubmed
- d. **Websites:**
- <https://www.onlinejase.com/>
  - <https://academic.oup.com/ehjcmaging>

10. Course Organization

<b>Course title</b>	Cardiac evaluation and therapies - I	
<b>Course Code</b>	CCC204A	
<b>Course Leader's Name</b>	As per time table	
<b>Course Leader Contact Details</b>	Phone:	
	E-mail:	
<b>Course Specifications Approval Date</b>		
<b>Next Course Specifications Review</b>		

  
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### Course Specifications : Applied Cardiac care technology - I

Course Title	Applied Cardiac care technology - I
Course Code	CCC205A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

To understand & Describes the Non-invasive (ECG & Echo) of Ischemic, Valvular, cardiomyopathies and invasive procedures

##### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Describe the ECG features in various cardiac diseases
2.	Explain Echocardiographic features of Valvular, cardiomyopathies & ischemic heart diseases
3.	Describe the usefulness of intensive coronary care unit, CCU & ICCU
4.	Explain the Cardiac catheterization procedures, complications & management
5.	Interpret ECG findings & ECHO diagnosis of Heart diseases
6.	Apply the theoretical & practical skills in cardiac catheterization,

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#### 4. Course Contents

##### Unit – 1 (Non – Invasive Diagnostics: ECG)

- ECG in Myocardial Ischemia & Infarction, ECG criteria of Myocardial Infarction, ECG in anterior wall, inferior wall, true posterior wall and subendocardial infarction and RV MI
- ECG in Valvular heart diseases: ECG changes in rheumatic heart diseases – inMS, AS, TS & PS, ECG changes in MR, AR, TR & PR
- ECG in Cardiomyopathies
- Conduction Disturbances: SA block, AV block, Bundle branch blocks, Fascicular blocks, Sick sinus syndrome
- Chamber enlargements & Hypertrophy
- ECG in miscellaneous conditions: Myxedema, hyper and hypokalemia, Chronic kidney disease
- Tilt table Test, Ankle brachial index

##### Unit – 2 (Echocardiography)

- Assessment of Cardiac function: measurements of all cardiac chambers and assessment of cardiac function by recommended guidelines
- Normal anatomical variants of right & left heart
- Echo in ischemic heart diseases: echo in acute MI, old MI and role of echo, complications of MI, role of echo in risk stratification and clinical decision making
- Echo in Valvular heart diseases: echo in mitral stenosis & incompetence, aortic stenosis & incompetence, Low flow low gradient AS, TS, TR & PS, PR and infective endocarditis
- Echo in Cardiomyopathies: DCM, HCM, RCM
- Stress Echo: Introduction, Applications of stress echo, Types, Indications & contraindications, Patient preparation & procedure, Protocols used, Interpretation and Complications. Role of stress echo in ischemic and valvular heart diseases

##### Unit – 3 (Cardiac Cath & Intervention – I)

- Cardiac Monitoring: Introduction, Purpose of cardiac monitoring, How to setup Intensive Coronary Care unit, usefulness of ICCU or CCU
- Right Heart Catheterization: Introduction, indications, contraindications
- Patient preparation & materials used, Procedure, angios done, CO measurement & its interpretation, Complications & Management
- Left Heart Catheterization: Introduction, indications, contraindications, patient preparation & materials used, Procedure, LV angios done & its interpretation, Complications & Management
- Detection, Localization and Quantification of Intracardiac Shunts: Oximetry study, flow ratio & shunt flow calculations, Step up & step down and its significance

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- Pressure measurements: Right and left heart pressure wave forms, significance of pressure measurements in diagnosing and grading the severity of cardiac diseases. Errors and corrective measures in pressure measurement
- Coronary Angiogram: Coronary vascular system, Indications & contraindications, patient preparation & materials used, Procedure - angio views, Interpretation, Complications & Management
- Peripheral Angiogram: Indications & contraindications, patient preparation & materials used, Procedure - angio views, Interpretation, Complications & Management


#### 5.Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1			3		1					2		
CO-2			3		1					2		
CO-3			3		2					1		
CO-4			2			3				1		
CO-5					2	3					1	
CO-6			2		3						1	


3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

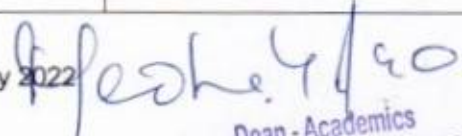
#### 6.Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		

  
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1. Case Study Presentation		32
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written exam & Lab exam		07
Total Duration in Hours		103

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- Online Test
- Problem Solving
- Field Assignment
- Open Book Test
- Portfolio
- Reports
- Case Study
- Group Task
- Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

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SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- ECG
  - Leo Schamroth
  - Mervin Goldmann
  - Marriott's Practical Electrocardiography
- ECHO
  - Braunwald Heart Disease
  - Hurts Heart Disease
  - Moss & Adams
- CATH
  - William Grossman
  - Eric Topols
  - Morten B Kern

b. Recommended Reading

- Class Notes

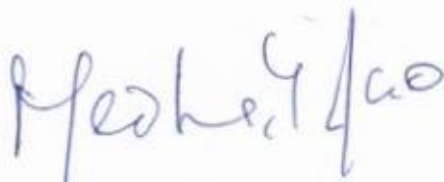
c. Journals:

- Pubmed

d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

  
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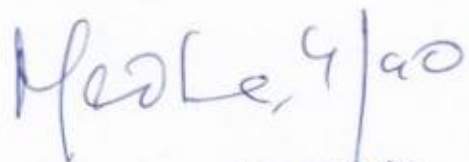
  
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10. Course Organization

Course title	Applied cardiac care technology - I	
Course Code	CCC205A	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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## Course Specifications : Directed clinical education - 2

Course title	Directed clinical education - 2
Course Code	CCC206A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

#### 1. Aim and Summary

To learn about the clinical aspects of cardiac care and implement the knowledge in cardiac care technology.

#### 2. Course Size and Credits

Number of credits	8
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	256
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Interpret the ECG features in various cardiac diseases
2.	Identify the structure & function of by Echocardiography
3.	Illustrate the hemodynamics of cardiac chambers by catheterization
4.	Discuss the diagnosis & complications of cardiac procedures

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5.	Formulate case study by observation different cardiac cases
----	---

4. Course Contents

**Unit – 1**

- ACS – Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery
- (Non – Invasive Diagnostics: ECG):
- ECG in Myocardial Ischemia & Infarction, ECG criteria of Myocardial Infarction, ECG in anterior wall, inferior wall, true posterior wall and sub endocardial infarction and RV MI
- ECG in Valvular heart diseases: ECG changes in rheumatic heart diseases – in MS, AS, TS & PS, ECG changes in MR, AR, TR & PR
- ECG in Cardiomyopathies (Echocardiography)

**Unit – 2 (Echocardiography)**

- Echo in ischemic heart diseases: echo in acute MI, old MI and role of echo, complications of MI, role of echo in risk stratification and clinical decision making
- Echo in Valvular heart diseases: echo in mitral stenosis & incompetence, aorticstenosis & incompetence, Low flow low gradient AS, TS, TR & PS, PR and infective endocarditis
- Echo in Cardiomyopathies: DCM, HCM, RCM

**Unit – 3 (Cardiac Cath & Intervention – I)**

- Right Heart Catheterization
- Left Heart Catheterization
- Coronary Angiogram
- Pressure measurements
- Peripheral Angiogram

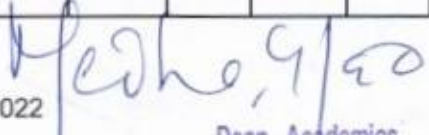
  
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4. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PS O-1	PSO -2	PSO-3	PSO-4
CO-1			1		3				2			
CO-2				1	3				2			
CO-3			1		3					2		
CO-4			1		3				2			

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CO-5			1		3					2	
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution											

5. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		00
<b>Demonstrations</b>		00
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		00
1. Solving Numerical Problems	-	
<b>Practical Work</b>		256
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		00
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
<b>Total Duration in Hours</b>		<b>256</b>

6. Method of Assessment

SC1 (Internal Viva )	SC2 (Logbook)
50 Marks	50 Marks

  
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In Option 2, there shall be two subcomponents, each carrying 5 marks.

After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100% Weightage.

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## 7. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

## 8. Course Resources

### a. Essential Reading

- Braunwald Heart Disease
- Hurts Heart Disease
- Moss & Adams
- Vijay Raghavan
- Alagappans

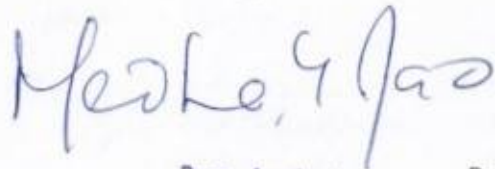
### b. Recommended Reading

- Log Book

### c. Journals:

- Pubmed

  
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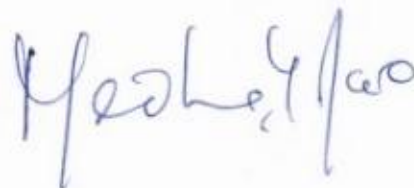
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d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcimaging>

  
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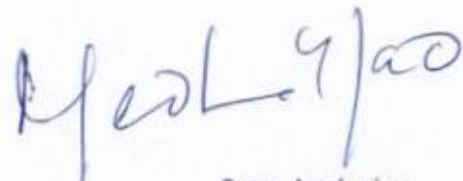
**Programme Structure and Course Details of B.Sc.  
(Hons)  
Cardiac Care Technology 2022-2026**



**B.Sc. (Hons) in Cardiac Care Technology 2022-2026**

**SEMESTER -5**


  
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## CARDIAC EVALUATION AND THERAPIES – II

Course Title	Cardiac Evaluation and Therapies- II
Course Code	CCC301A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

#### 1. Aim and Summary

This course aims to impart basic knowledge of various congenital and systemic heart diseases. The students are oriented to the concepts cardiac embryology, pathophysiology and hemodynamics of various congenital and systemic heart diseases. The students are exposed to clinical examination and are also taught the role of appropriate diagnostic tests which helps them in diagnosing various congenital and systemic heart diseases.

#### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Explain cardiac embryology and its significance in classifying congenital heart diseases
2.	Describe morphology, etiology, hemodynamics and clinical features of various congenital heart diseases
3.	Describe etiologies, hemodynamics and clinical features associated with disease states including Ischemic, Myo - Pericardial & aortic heart diseases

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	and Cardiac Masses
4.	Explain the role of relevant screening and various diagnostic tests appropriate for cardiovascular risk stratification and management plan for patients with congenital and systemic heart diseases
5.	Describe etiologies, clinical presentations of various non-cardiac diseases and its effect on cardiovascular system
6.	Demonstrate how to approach and the role of non-invasive and invasive diagnostic tests in diagnosing and managing the underlying pathologies

#### 4. Course Contents

##### Unit – 1 (Congenital Heart Defects)

- Embryology, Fetal & Adult Circulation
- Introduction to CHD's & Classification
- Acyanotic CHD'S – ASD, VSD, PDA, PAPVC, Stenotic lesions – etiology, clinical presentation, diagnosis & management
- Cyanotic CHD'S – TOF, TGA, DORV, Endocardial cushions defects, TAPVC, Ebstein's Anomaly – etiology, clinical presentation, diagnosis & management
- Dextrocardia

##### Unit – 2 (Myocardial – Pericardial Diseases)

- Pericardial diseases: Introduction, types. Etiology, clinical presentation, diagnosis & management of pericardial effusion, tamponade, constrictive pericarditis, Constrictive vs Restrictive pathophysiology
- Myocardial diseases - Introduction, types, etiology, clinical presentation, diagnosis & management

##### Unit – 3 (Aortic Diseases)

- Introduction & Types
- Etiology, clinical presentation, diagnosis & management of aortic aneurysm, aortic dissection, RSOV, aortic trauma

##### Unit – 4 (Cardiac Masses & Tumors)

- Introduction, primary cardiac tumors, Metastatic cardiac tumors - etiology, clinical presentation, diagnosis & management

##### Unit – 5 (Medicine Relevant to CCT)

- Pulmonary Edema
- Hypertension, Diabetes Mellitus

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- Hematology – Anaemia, bleeding disorders – impact on CVS
- COPD, ARDS – impact on cardiovascular system
- Renal System – AKI, CKD, Role of dialysis – impact on cardiovascular system

#### Practical Contents

##### Unit – 1 (Congenital Heart diseases)

- Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery

##### Unit – 2 (Myocardial – Pericardial Diseases)

- Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery

##### Unit – 3 (Aortic Diseases)


- Clinical Examination, Physical Examination, Diagnosis & Management: clinical decision making, timing of surgery

##### Unit -4 (Medicine Relevant to CVT)

- Diagnostic tests and interpretation of COPD, ARDS, Anemia, Bleeding disorders, AKI, CKD and its impact on Cardio Vascular System

#### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1							1			
CO-2	3	1							1			
CO-3	3	1							3			
CO-4	3	1							3			
CO-5	3	1							2			
CO-6	3	2	2	1	2	1	1	1	3	1		1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												

  
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## 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. hospital	-	
5. Model Studio	-	
<b>Others</b>		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
<b>Total Duration in Hours</b>		<b>103</b>

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following

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types:

- a) Online Test
- b) Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Any other

After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

#### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

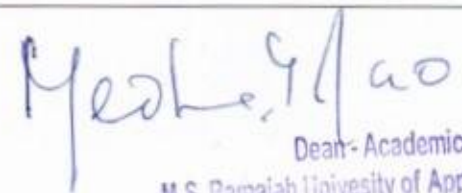
  
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## 9. Course Resources

### a. Essential Reading

- Leo Schamroth - Electrocardiography
- Cardiac Embryology: Indrabeer Singh
- Congenital Heart Diseases: 1) Myung Park, 2) J K Perloff 3) Moss and Adams
- Feigenbaum's Echocardiography – 7<sup>th</sup> or 8<sup>th</sup> edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5<sup>th</sup> edition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

### b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Class notes

### c. Journals:

- Pubmed

### d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

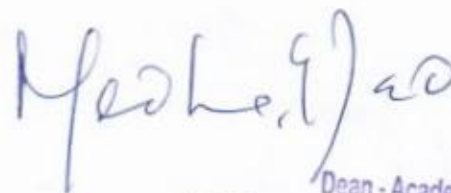
## 10. Course Organization

Course Code	CCC301A	
Course Title	Cardiac Evaluations and Therapies- II	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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## APPLIED CARDIAC CARE TECHNOLOGY - II

Course Title	Applied Cardiac Care Technology- II
Course Code	CCC302A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

### I. Course Summary

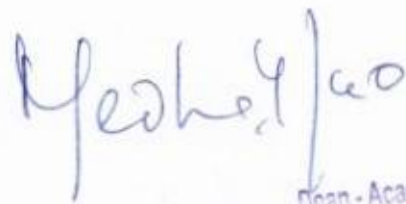
#### 1. Aim and Summary

The aim of this course is to introduce students to non-invasive and invasive diagnostic tests used in the department of cardiology. The students are introduced to the concepts of electrocardiography, echocardiography and exposed to the applications of these modalities in diagnosing congenital and systemic heart diseases. The students are also exposed to interventional cardiology which help them in understanding the role of various interventional procedures in management of underlying conditions

#### 2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

  
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## II. Teaching, Learning and Assessment

### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Explain the concept of cardiac arrhythmias its types, mechanism and ECG features of various congenital and systemic heart diseases
2.	Describe 2D features and Doppler echocardiographic methods to assess various congenital heart diseases
3.	Describe 2D features and Doppler echocardiographic methods to assess various systemic heart diseases and significance of contrast echo
4.	Describe the role of various interventional procedures, pacemakers and defibrillators in management of disease states including congenital, systemic heart diseases and cardiac arrhythmias
5.	Demonstrate how to approach, perform and clinical importance of different echo views and various Doppler methods and its limitations in diagnosing congenital and systemic heart diseases
6.	Demonstrate patient preparation, equipment handling and materials to be used and role of cardiac technologist during various interventional procedures performed for underlying cardiac pathologies

### 4. Course Contents

#### Unit – 1 (Non – Invasive diagnostic Tests: ECG)

- ECG in Congenital Heart diseases: Acyanotic – ASD, VSD, PDA, Cyanotic – TOF, DORV, TGA, Endocardial cushion defects, Ebstein's Anomaly, Dextrocardia – True and Technical dextrocardia
- ECG in pericardial and myocardial diseases – Acute pericarditis, pericardial effusion, tamponade and myocarditis
- ECG in aortic diseases – Aortic dissection, RSOV
- Cardiac Arrhythmias – introduction, mechanism, bradyarrhythmias, tachyarrhythmias – types, mechanism, ECG criteria, Complications
- WPW syndrome
- Holter monitoring, Ambulatory BP monitoring, loop recorders
- Defibrillators

#### Unit – 2 ((Non – Invasive diagnostic Tests: ECHO)

- Echo in Congenital Heart defects: Introduction, Pediatric ECHO – Transducer

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selection, Basic echo views, Echo findings in Acyanotic and cyanotic congenital heart defects, role of echo in risk stratification and timing of surgery

- Echo in Myocardial and Pericardial Diseases: Myocarditis, Pericardial effusion, Cardiac Tamponade, Constrictive Pericarditis, Constrictive vs Restrictive Pericarditis
- Echo in aortic diseases: Aortic aneurysm, aortic dissection, RSOV, aortic trauma
- Echo in Pulmonary arterial hypertension and pulmonary embolism
- Echo in Cardiac masses and tumors
- Contrast Echo – Indications, contraindications, types, procedure and interpretation, role of contrast echo in ischemic, congenital and valvular heartdiseases
- Prosthetic Valves: Introduction, Types, evaluation of prosthetic valve function by echocardiography

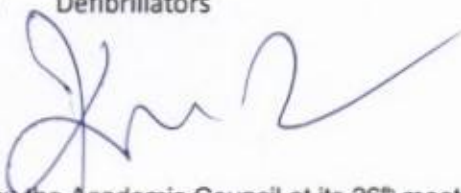
### Unit – 3 (Cardiac Cath and Intervention – II)

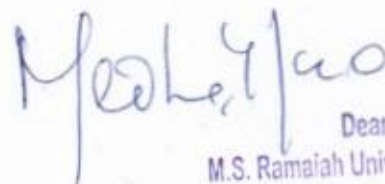
- Carotid, Cerebral and renal angiography
- Device Closures: Introduction, Types of devices. Indications, contraindications, materials used, procedure, complications & management of ASD, VSD, PDA, Coil Closure of PDA
- Valvuloplasties : PTMC, pulmonary and aortic valvuloplasty, LA appendage closure device
- Pacemakers: Basic concepts of pacemaker, Temporary and Permanent Pacemakers, Indications and Contraindications, Single chamber and dual chamber pacing, Bi-ventricular pacing, Pacemaker problems, Implantable Cardioverter Defibrillators
- Fractional Flow Reserve
- Rotablator
- Cardiac Cath & Intervention in HOCM

  
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### Practicals Course Contents Unit – 1 (ECG)

- ECG in CHD's: Performing & interpretation of ECG and making diagnosis
- ECG in arrhythmias, WPW syndrome: Performing & interpretation of ECG and making diagnosis
- ECG in myocardial – Pericardial diseases and aortic diseases: Performing & interpretation of ECG and making diagnosis
- Holter monitoring, Ambulatory BP monitoring, Loop recorders – patient preparation, interpretation, clinical significance
- Defibrillators





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### Unit – 2 (Echocardiography)

- ECHO in Congenital heart defects: views used, clinical applications of 2D & Doppler methods to diagnose and quantify severity, Technical factors in image optimization
- ECHO in myocardial – pericardial diseases: views used, clinical applications of 2D&Doppler methods to diagnose and quantify severity, Technical factors in image optimization
- ECHO in aortic diseases: views used, clinical applications of 2D & Doppler methods to diagnose and quantify severity, Technical factors in image optimization of Echo in PAH, Pulmonary Embolism, Cardiac tumors & masses
- Echocardiographic evaluation of prosthetic valve function

### Unit – 3 (Cardiac Cath & Intervention III)

- Patient preparation, preparing for procedure, views, management of complications of Cerebral, carotid, renal angiography, Device closures, Valvuloplasties, Pacemakers & Defibrillators, FFR, Rotablator, Septal myectomy

### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1							2			
CO-2	3	1	1		2				3	1		
CO-3	3	1	1		2				3	1		
CO-4	3	1	1		2				3	1		
CO-5	3	1	2	1	2	1	1	2	2	1		1
CO-6	3	2	2	1	2	1	1	2	3	1		1

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

### 6. Course Teaching and Learning Methods

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Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		32
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	

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<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

### 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- a) Online Test
- b) Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component aspart of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative

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(Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

### 9. Course Resources

#### a. Essential Reading

- A text book of Electrocardiography -Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7<sup>th</sup> or 8<sup>th</sup> edition
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5<sup>th</sup> edition
- ASE's Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

#### b. Recommended Reading

- ECG Made Easy – Atul Luthra
- Echo Made Easy – Atul Luthra
- Class notes

#### c. Journals:

- Pubmed


#### d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

  
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10. Course Organization

Course Code	CCC302A	
Course Title	Applied Cardiac Care Technology – II	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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## Project Management

Course Title	Project Management
Course Code	AHM305A
Department	Directorate of Transferable Skills and Leadership Development
Faculty / School	All Faculties / Schools of RUAS

### I. Course Summary

#### 1. Aim and Summary

With the advent of technology, changing business environments, varying economic conditions and prevailing political situations, a varied types of projects are being undertaken. This is seen in different segments such as infrastructure, construction, Information Technology, Manufacturing, Engineering, Health Care, Hospitality, Logistics and Services. Along with these, there is a big need for manpower with competencies in Managing different types and sizes of projects. A Project Management Professional equipped with,

- Appropriate tools and techniques,
- An ability to apply appropriate methods and processes
- Appropriate project leadership skills and
- A structured approach to manage a project in its entirety will be in a better position to ensure a project's defined success.

The course aims at imparting knowledge and developing competencies on various aspects of Project Management as per International Project Management Association's framework. This course also provides a glimpse of tools, techniques, methods and process for managing a project effectively. This course offers a structured approach which are derived from the experiences of a large number of successful global organizations.

#### 2. Course Size and Credits:

Number of credits	03
Total hours of teaching and learning activities during the semester	45
Number of practical/tutorial hours	15
Number of semester week(s)	15

  
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Department responsible	Directorate of Transferable Skills and Leadership Development
Course evaluation	Total Marks: 100
Pass requirement	40% (min) in Component 1 and 40% (min) in Component 2
Attendance requirement	As per the Academic Regulations


## II. Teaching, Learning and Assessment

### 3. Course Outcomes (CO)

Upon completion of this course students will be able to:

No.	Course Outcomes (COs)
1.	Explain the characteristics of projects, Operations and principles of Project Management
2.	Discuss the Project Management Competency Elements as per PMA's Individual Competence Baseline Ver 4.0
3.	Discuss the tools for Project Execution, Monitoring and control
4.	Apply the tools for project planning and Create a Project Management Plan covering Project Charter, Work Breakdown Structure, Project Organisation, Time Management Plan and Risk Management Plan


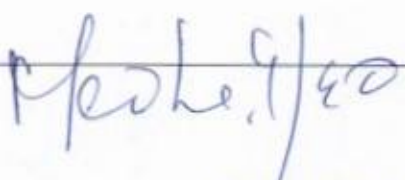
### 4. Course Contents:

<p><b>Section 1</b> Introduction to Project, Programmes, Portfolio and Operations Project Organization and Permanent Organization Project Management Success</p> <ul style="list-style-type: none"> <li>• KRAs</li> </ul> <p>Creation of project</p> <ul style="list-style-type: none"> <li>• Need analysis</li> <li>• Business Case</li> <li>• Project Charter</li> </ul>	 Registrar M.S. Ramaiah University of Applied Sciences Bangalore - 560 054
<p><b>Section 2</b> Requirements, Objectives &amp; Benefits Scope</p> <ul style="list-style-type: none"> <li>• WBS</li> </ul>	

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<ul style="list-style-type: none"> <li>• Scope baseline</li> <li>• Change Management</li> </ul> <p>Time Management</p> <ul style="list-style-type: none"> <li>• Lifecycle</li> <li>• AOA (ADM)</li> <li>• AON (PDM)</li> <li>• CPM</li> <li>• Floats</li> <li>• Network Exercises</li> <li>• Gantt Charts</li> <li>• Bar Charts</li> </ul> <p>Resources</p> <ul style="list-style-type: none"> <li>• Resource Calendar</li> </ul>	<p><b>Section 3</b></p> <p>Controlling</p> <p>Handling Changes</p> <p>Phase end and Close out</p> <p>Earned Value Management System</p> <ul style="list-style-type: none"> <li>• Variances, SPI &amp; CPI</li> <li>• Numerical Exercises</li> </ul> <p>Quality Management</p> <ul style="list-style-type: none"> <li>• Quality Planning</li> <li>• Quality Assurance</li> <li>• Quality Control</li> <li>• Quality Tools <ul style="list-style-type: none"> <li>○ Pareto Chart</li> <li>○ Control Chart</li> <li>○ Inspections</li> <li>○ Benchmarking</li> </ul> </li> </ul> <p>Risk &amp; Opportunity</p> <ul style="list-style-type: none"> <li>• Risk categories</li> <li>• Identification</li> <li>• Risk Analysis</li> </ul>
<p><b>Section 4</b></p> <p>Organization and Information</p> <p>Stakeholder Management</p> <p>Power and Interest</p> <p>Culture and Values</p> <p>Personal integrity and reliability</p> <p>Personal communication</p> <ul style="list-style-type: none"> <li>• Communication Planning</li> <li>• Communication methods</li> <li>• Communication barriers</li> </ul> <p>Conflict and crisis</p> <p>Resourcefulness</p> <p>Result Orientation</p>	<div style="text-align: center;">  <p>M.S. Ramaiah University of Applied Sciences Bangalore - 560 054</p> </div> <div style="text-align: right; margin-top: 20px;">  <p>Dean - Academics</p> </div>



## 5. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		20
<b>Demonstrations</b>		
1. Demonstration using Videos		
2. Demonstration using Physical		
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital		
6. Model Studio		
<b>Others</b>		
1. Case Study Presentation	05	
2. Guest Lecture		
3. Industry/Field Visit		25
4. Brain Storming Sessions		
5. Group Discussions	20	
6. Discussing Possible Innovations		
Written Examination (Term tests and SEE)		05
<b>Total Duration in Hours</b>		<b>50</b>

## 6. Method of Assessment

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The details of the components and subcomponents of course assessment are presented in the Programme Specifications document pertaining to the respective Undergraduate Programme. The procedure to determine the final course marks is also presented in the Programme Specifications document.

The evaluation questions are set to measure the attainment of the COs. In either component (CE or SEE) or subcomponent of CE (SC1 or SC2), COs are assessed as illustrated in the following Table.

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Focus of COs on each Component or Subcomponent of Evaluation				
		Component 1: CE (50% Weightage)		Component 2: SEE (50% Weightage)
		SC1	SC2	
Subcomponent ▶				
Subcomponent Type ▶		Mid Term Exam	Assignment	50 Marks
Maximum Marks ▶		25	25	
CO-1	Explain the characteristics of projects, Operations and principles of Project Management	X		X
CO-2	Discuss the Project Management Competency Elements as per PMA's Individual Competence Baseline Ver 4.0	X		X
CO-3	Discuss the tools for Project Execution, Monitoring and control	X	X	X
CO-4	Apply the tools for project planning and Create a Project Management Plan covering Project Charter, Work Breakdown Structure, Project Organisation, Time Management Plan and Risk Management Plan		X	X

The Course Leader assigned to the course, in consultation with the Head of the Department, shall provide the focus of COs in each component of assessment in the above template at the beginning of the semester.

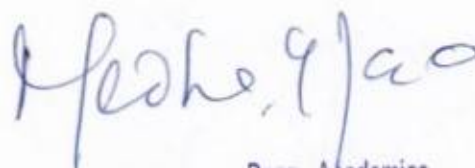
Course reassessment policies are presented in the Academic Regulations document

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## 7. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods

  
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S.No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Class room lectures
2.	Understanding	Class room lectures
3.	Critical Skills	Class room lectures
4.	Analytical Skills	Group discussion
5.	Problem Solving Skills	Case discussions / Group Discussions
6.	Practical Skills	Case discussions
7.	Group Work	case study and group discussions
8.	Self-Learning	Seminars
9.	Written Communication Skills	Examination
10.	Verbal Communication Skills	Group discussions
11.	Presentation Skills	Seminars, Case discussions
12.	Behavioral Skills	Group discussion, Case discussions
13.	Information Management	Case discussions
15.	Leadership Skills	Group discussions

## 8. Course Resources

### a. Essential Readings

- Course Notes
- Pinto Jeffrey K. (2019) Project Management: Achieving Competitive Advantage, 5<sup>th</sup> Edition, Pearson

### b. Recommended Readings

- Meredith, J.R. and Mantel, S.J. (2005) Project Management – a managerial approach, 6<sup>th</sup> edition, Wiley
- Ghattas, R. G. and Sandra L. Mckee (2001) Practical Project Management, New Jersey, Prentice Hall

### c. Magazines and Journals

- Project Manager Today
- PM network
- International Journal of Project and Operation Research, Inderscience
- Journal of Operation Management, Project and Operation Research, INFORMS

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d. Websites

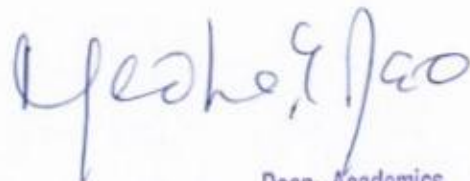
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- <http://library.kent.ac.uk/library/exampapers/deptcourses.php?dept=Business%20Studies>
- [http://homepages.stmartin.edu/fac\\_staff/dstout/MBA631/lecture\\_notes.htm](http://homepages.stmartin.edu/fac_staff/dstout/MBA631/lecture_notes.htm)

10. Course Organisation

Course Title	Project Management	
Course Code	AHM305A	
Course Leader/s Name	Mr. Jyothi Shankar G	
Course Leader Contact Details	Phone:	080 – 4536 6666
	E- mail:	
Course Specifications Approval		
Next Course Specifications Review		

  
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### DIRECTED CLINICAL EDUCATION -3

Course Title	Directed Clinical Education - 3
Course Code	CCC303A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

This course aims at imparting practical skills of performing and interpreting ECG, ECHO and how to overcome technical problems, maintenance and upkeep of equipment used in ECG, ECHO and cath lab. Students are oriented to how to approach patients and pretest requisites and will be taught how to assist, pre and post patient care during various interventional procedures.

##### 2. Course Size and Credits

Number of credits	10
Total hours of class room interaction during the semester	300
Number of tutorial & Laboratory hours	320
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations


#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Demonstrate how to perform physical examination which aids in diagnosing various cardiac pathologies

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2.	Demonstrate how to interpret given ECG and diagnose various cardiac Pathologies
3.	Demonstrate how to approach, perform and to know the importance of 2D and Doppler methods, their technical limitations in diagnosing the various cardiac pathologies
4.	Prepare the patient and arrange the materials used in cathlab for various interventional procedures
5.	Demonstrate the clinical utility and post procedural care of each interventional procedure and measures to overcome associated complications during the procedures

#### 4. Course Contents

- **ECG:**

Performing and Interpretation of ECG of Congenital, Myo-pericardial diseases, Aortic diseases and Cardiac masses

- **ECHO:**

Patient Preparation, Performing and application of various methods to diagnose Congenital, Myo-pericardial diseases, Aortic diseases and Cardiac masses

- **Cardiac Cath & Intervention III**

Patient preparation, equipment maintenance and prerequisites, assistance during procedure, management of complications of Cerebral, carotid, renal angiography, Device closures, Valvuloplasties, Pacemakers & Defibrillators, FFR, Rotablator, Septal myectomy procedures

#### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1		2	3		2				2			
CO-2		1	3	1	3		1	1	3	1		1
CO-3		2	3	1	3	1	1	1	3	1	1	1
CO-4		2	3	1	3		1	1	3	1		1
CO-5		2	1	3	3	1		1	3		1	

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

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### 6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		00
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		320
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
<b>Total Duration in Hours</b>		<b>320</b>

### 7. Method of Assessment

SC1 (Internal Viva )	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test

After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100% Weightage.

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### 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioral Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

### 9. Course Resources

#### a. Essential Reading

- Leo Schamroth - Electrocardiography
- Cardiac Embryology: Indrabeer Singh
- Congenital Heart Diseases: 1) Myung Park, 2) J K Perloff 3) Moss and Adams
- Feigenbaum's Echocardiography – 7<sup>th</sup> or 8<sup>th</sup> edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5<sup>th</sup> edition
- ASE Comprehensive Echocardiography

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- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D.Baim

**b. Recommended Reading**

- Log Book

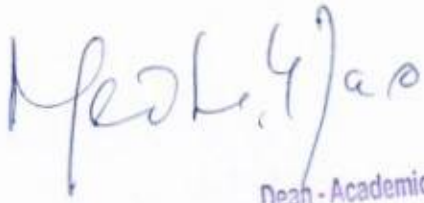
**c. Websites:**

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

**10. Course Organization**

Course Code	CCC303A	
Course Title	Directed Clinical Education -3	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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# B.Sc. (Hons) in Cardiac Care Technology 2022 2026


## SEMESTER -6

  
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**Course specifications : Nuclear Cardiology**

Course Title	<b>Nuclear Cardiology</b>
Course Code	<b>CCC304A</b>
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

**I. Course Summary**

**1. Aim and Summary**

The aim of this course is to introduce students to the basic concepts of nuclear imaging. Students are oriented to the concepts of basic principles, equipment used, its working principle and also exposed to patient preparation, procedures of nuclear imaging and emphasize the role of nuclear imaging in assessment of cardiac diseases

**2. Course Size and Credits**

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

**II. Teaching, Learning and Assessment**

**3. Course Outcomes (COs)**

After the successful completion of this course, the student will be able to:

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No.	Course Outcome
1.	Describe the basic principles and clinical importance of nuclear imaging in the field of cardiology
2.	Explain equipment used, its working principle, procedure of MPI and clinical importance of myocardial viability for risk stratification
3.	Explain equipment used, its working principle, procedure and clinical importance of PET & SPECT in diagnosing coronary artery disease
4.	Explain equipment used, its working principle, procedure and clinical importance of cardiac MRI in diagnosing various cardiac diseases
5.	Demonstrate how to approach, patient preparation and equipment maintenance and clinical importance of myocardial perfusion imaging

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6.	Demonstrate how to approach, patient preparation and equipment maintenance and clinical importance of cardiac MRI in diagnosing cardiac pathologies
----	---

4. Course Contents

**Unit – 1**

- Introduction
- Physiology, Quantification of function

**Unit – 2 (Conventional Nuclear Medicine)**

- Basic Principle, Equipment Used
- Indications, Contraindications, Procedures
- Role of MPI in diagnosing and Assessing severity of CAD

**Unit – 3(PET & SPECT Scan)**

- Basic Principle, Equipment Used, Radiotracers used
- Indications, Contraindications, Procedure – Protocols, Technical artifacts
- Interpretation, Limitations
- MUGA Scan

**Unit – 4 (CT & MRI)**

- Basic Principle, Equipment Used & its working principle
- Indications, Contraindications, Procedures, Limitations
- Role of CT & MRI in assessment of various cardiac diseases

**Practicals**

- Instrumentation – Working principle and maintenance
- Patient preparation and protocols used, Interpretation, Record maintenance
- Clinical importance of MPI and CT & MRI imaging in assessing various cardiac pathologie

  
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5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	P O-1	P O-2	P O-3	P O-4	P O-5	P O-6	P O-7	P O-8	P SO-1	PS O-2	PS O-3	P SO-4
CO -1	2	1							2			
CO -2	3	1							2			
CO -3	3	1							2			
CO -4	3	1							2			
CO -5	3	1	1	1	1			1	3			1
CO -6	3	1	1	1	1			1	3			1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												

6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
<b>Face to Face Lectures</b>		32
<b>Demonstrations</b>		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
<b>Numeracy</b>		
1. Solving Numerical Problems	-	
<b>Practical Work</b>		32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
<b>Others</b>		32
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		

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5. Group Discussions	
6. Discussing Possible Innovations	-
Term Test, Semester End Exam & Lab Exam	7
Total Duration in Hours	103

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- Online Test
- Problem Solving
- Field Assignment
- Open Book Test
- Portfolio
- Reports
- Case Study
- Group Task
- Any other



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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment

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4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

9. Course Resources

a. Essential Reading

- Mettler
- Gopal B Saha

b. Recommended Reading

- Class notes

c. Journals:

d. Pubmed

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10. Course Organization

Course Code	CCC304A	
Course Title	Nuclear cardiology	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

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**Course specifications : Advanced cardiac care technology**

Course Title	Advanced cardiac care technology
Course Code	CCC305A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

**I. Course Summary**

1. Aim and Summary

The aim of this course is to introduce students to the newer advanced modalities used in the field of cardiology. The students are oriented to the basic principles, equipment used and also exposed to the clinical application of advanced modalities and emphasized their role in diagnosing various cardiac pathologies

2. Course Size and Credits

Number of credits	4
Total hours of class room interaction during the semester	32
Number of tutorial/ Laboratory hours	64
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

**II. Teaching, Learning and Assessment**

3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Describe basic concepts, equipment used, working principle, procedure and interpretation of newer modalities used in electrocardiography
2.	Describe basic concepts, equipment used, working principle, procedure and interpretation of newer imaging techniques used in echocardiography
3.	Explain clinical importance of Trans esophageal echo, TDI, Strain imaging, Intracardiac Echo in diagnosing various cardiac pathologies



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4.	Describe basic concepts, equipment used, working principle, clinical importance of newer interventional procedures
5.	Demonstrate how to approach, patient preparation, maintenance of equipment protocols used, interpretation and post procedure care of special procedures used in echocardiography
6.	Demonstrate how to approach, patient preparation, maintenance of equipment protocols used, interpretation and post procedure care of newer interventional procedures and their diagnostic utility

#### 4. Course Contents

##### Unit – 1: (Non – Invasive Diagnostics – ECG)

- Newer technologies for monitoring the patients with heart diseases

##### Unit – 2: (Non – Invasive Diagnostics – ECHO)

- Trans esophageal Echocardiography: Introduction, indications & contraindications, Transducer – position, orientation and manipulation, TEE probe – Types, views, Role of TEE in various cardiac diseases
- Tissue Doppler Imaging & Strain Imaging: Principles, Advantages, Disadvantages, Role of TDI & Strain imaging in diagnosis of various cardiac diseases
- Intracardiac Echocardiography: Instrumentation & Technique, Applications & Limitations
- Storage and retrieval of echo images
- Newer types of ultrasound scanners: Portable, Laptop, Handheld, Palm held, Point of care echoes
- Cardiac Dyssynchrony

##### Unit – 3 (Cardiac Cath & Intervention IV)

- IVC filter
- Cardiac resynchronization therapy
- EP Study: Introduction, Indications & Contraindications, Materials used, procedure & complications
- IVUS
- Cardiac assist devices: Indications, Procedure, Materials used, Complications of: IABP, Impella, LVAD, ECMO
- Recent advances in interventional cardiology: Procedure, Materials used, Complications of TAVI, Mitra clips and role of echo in these procedures

##### Practical Course Contents: Unit – 1 (ECHO)

- TEE – Demonstration of patient preparation, equipment used, procedure, identification of cardiac structures, views and interpretation of diagnosis
- 3D Echo - Demonstration of equipment used, views, identification of cardiac structures and

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interpretation

- TDI & Strain Imaging: steps to acquire & perform, analysis and clinical significance
- Role of Intra cardiac Echo
- Recording, storage and retrieval of Echo images

**Unit – 2 (Cardiac Cath & Intervention IV)**


- Demonstration and role of newer advanced techniques in diagnosing and treating cardiac diseases – IVC filter, CRT, Cardiac assist devices, EP study, TAVI & Mitra clips

**5. Course Mapping**

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PS O-1	PSO-2	PSO-3	PSO-4
CO-1	3	1							2			
CO-2	3	1							2			
CO-3	2	1	3		2			1	3	1		1
CO-4	3	1							2			
CO-5	3	2	3	2	3	1	1	1	3	1	1	1
CO-6	3	2	3	2	3	1	1	1	3	1	1	1

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution

**6. Course Teaching and Learning Methods**

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		32
Demonstrations		 Registrar M.S. Ramaiah University of Applied Sciences Bangalore - 560 054
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		Registrar M.S. Ramaiah University of Applied Sciences Bangalore - 560 054
1. Solving Numerical Problems	-	
Practical Work		Registrar M.S. Ramaiah University of Applied Sciences Bangalore - 560 054  32
1. Course Laboratory		
2. Pathology Laboratory		
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		

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1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		32
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, Semester End Exam & Lab Exam		7
Total Duration in Hours		103

## 7. Method of Assessment

Theory Component CE			Laboratory Component CE	SEE
SC1 (Written Assignment)	SC2 (Innovative assignment)	SC3 (Mid-term test)	SC4 (Formative laboratory performance assessment)	SEE
20 Marks	20 Marks	20 Marks	30 Marks	60 (40 written exam; 20 Viva-voce)

In Option 2, there shall be four subcomponents, each carrying 25 marks. Out of these, there shall be two assignments and two term-tests. The assignments can be of any of the following types:

- a) Online Test
- b) Problem Solving
- c) Field Assignment
- d) Open Book Test
- e) Portfolio
- f) Reports
- g) Case Study
- h) Group Task
- i) Any other

  
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After the four subcomponents are evaluated, the CE component marks are consolidated to attain 60% Weightage. Laboratory/Practical shall be shifted as part of CE. The lab component as part of CE will have external examiner evaluation and marks listed separately for industry requirements. For a theory + laboratory course, the Semester End Examination shall be a 2-hour theory paper of 50 marks with a weightage of 40% and there will be a 20 marks Viva-Voce. In summary, the ratio of Formative (Continuous Evaluation-CE) Vs Summative (Semester End Examination-SEE) should be 60:40.

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## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars, Case Study Presentations
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

## 9. Course Resources

### a. Essential Reading

- A text book of Electrocardiography -Goldberger
- Leo Schamroth
- Feigenbaum's Echocardiography – 7th or 8th edition
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W.
- Grossman's D.Baim

### b. Recommended Reading

- Class notes

### c. Journals:

- Pubmed

### d. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcimaging>

  
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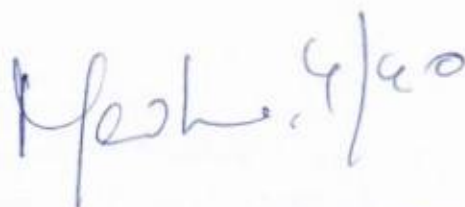
  
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10. Course Organization

Course Code	CCC305A	
Course Title	Advanced Cardiac Care Technology	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		

  
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### Course specifications : Directed clinical education - 4

Course Title	Directed clinical education - 4
Course Code	CCC307A
Department	Allied Health Sciences
Faculty	Life and Allied Health Sciences

#### I. Course Summary

##### 1. Aim and Summary

This course aims at imparting practical skills of performing newer imaging techniques and how to overcome technical problems and to impart knowledge in maintenance and upkeep of equipment used in ECG, ECHO and Cathlab. Students are oriented to the importance of newer techniques in patient care.

##### 2. Course Size and Credits

Number of credits	10
Total hours of class room interaction during the semester	00
Number of tutorial & Laboratory hours	320
Number of semester weeks	16
Department responsible	Allied Health Sciences
Total Course marks	100
Pass requirement	As per the Academic Regulations
Attendance requirement	As per the Academic Regulations

#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After the successful completion of this course, the student will be able to:

No.	Course Outcome
1.	Outline clinical importance of newer modalities in field of cardiology
2.	Demonstrate how to prepare, materials used, procedure and interpretation and post procedural care during Transesophageal echo
3.	Demonstrate indications, how to perform and to know the importance of tissue Doppler and strain imaging & their technical limitations in diagnosing the various cardiac pathologies

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4.	Prepare the patient and arrange the materials used in cathlab for various interventional procedures
5.	Impart knowledge of the clinical importance of newer interventional procedures over cardiac surgeries

#### 4. Course Contents

##### Unit – 1 (ECHO)

- TEE – Demonstration of patient preparation, equipment used, procedure, identification of cardiac structures, views and interpretation of diagnosis
- 3D Echo - Demonstration of equipment used, views, identification of cardiac structures and interpretation
- TDI & Strain Imaging: steps to acquire & perform, analysis and clinical significance
- Role of Intracardiac Echo
- Recording, storage and retrieval of Echo images

##### Unit – 2 (Cardiac Cath & Intervention IV)

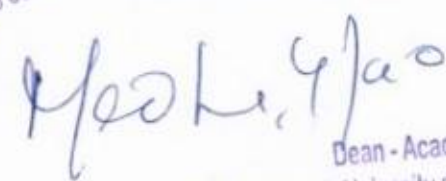
- Demonstration and role of newer advanced techniques in diagnosing and treating cardiac diseases – IVC filter, CRT, Cardiac assist devices, EP study, TAVI & Mitra clips

#### 5. Course Mapping

	Programme Outcomes (POs)								Programme Specific Outcomes (PSOs)			
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3								2			
CO-2		2	3	1	3				3			
CO-3		2	3	1	3		1	1	3			
CO-4		2	3	1	3		1		3		1	
CO-5		2	3	1	3		1	2	2	1		1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution												



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6. Course Teaching and Learning Methods

Teaching and Learning Methods	Duration in hours	Total Duration in Hours
Face to Face Lectures		00
Demonstrations		
1. Demonstration using charts		
2. Demonstration using Physical Models/Systems	-	
3. Demonstration on a Computer		
Numeracy		
1. Solving Numerical Problems	-	
Practical Work		
1. Course Laboratory		
2. Pathology Laboratory		320
3. Clinical Laboratory		
4. Hospital	-	
5. Model Studio	-	
Others		
1. Case Study Presentation		
2. Guest Lecture		
3. Industry/Field Visit	-	
4. Brain Storming Session/seminars		
5. Group Discussions		
6. Discussing Possible Innovations	-	
Term Test, written Exam & Lab Exam		00
Total Duration in Hours		320

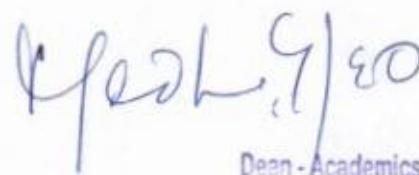
7. Method of Assessment

SC1 (Internal Viva )	SC2 (Logbook)
50 Marks	50 Marks

In Option 2, there shall be two subcomponents, each carrying 5 marks. Online Test

After the two subcomponents are evaluated, the CE component marks are consolidated to attain 100% Weightage.

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## 8. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SL. No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	Lectures
2.	Understanding	Practicals, Tutorials and lectures
3.	Critical Skills	Tutorials, SGD and Assignment
4.	Analytical Skills	Practicals and Assignment
5.	Problem Solving Skills	SGD
6.	Practical Skills	Practicals, OSPE
7.	Group Work	Seminars and SGD
8.	Self-Learning	SDL, SGD and assignment
9.	Written Communication Skills	Term test, Assignments, Semester exams
10.	Verbal Communication Skills	Seminars and SGD
11.	Presentation Skills	Seminars
12.	Behavioural Skills	SGD, Practical
13.	Information Management	Assignment
14.	Personal Management	Course work
15.	Leadership Skills	SGD

## 9. Course Resources

### a. Essential Reading

- Leo Schamroth - Electrocardiography
- Feigenbaum's Echocardiography – 7th or 8th edition,
- Textbook of Clinical Echocardiography – Catherine M. Otto, 5th edition
- ASE Comprehensive Echocardiography
- A Text of Cardiac Catheterization & Interventions. Dr. W.
- Grossman's D. Baim

### b. Recommended Reading

- Log Book

### c. Websites:

- <https://www.onlinejase.com/>
- <https://academic.oup.com/ehjcmaging>

  
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### 10. Course Organization

Course Code	CCC307A	
Course Title	Directed Clinical Education -4	
Course Leader's Name	As per time table	
Course Leader Contact Details	Phone:	
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review		



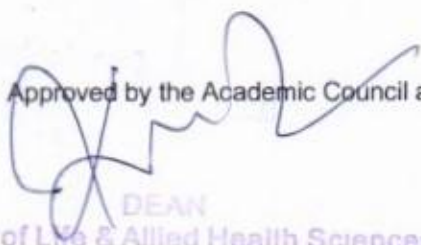
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OF APPLIED SCIENCES

**B.Sc. (Hons) in Cardiac Care Technology  
2022-2026**

**SEMESTER - 7**

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Registrar  
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*Heshu, G. Rao*

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*[Signature]*  
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## RESEARCH PROJECT

Course Title	Research Project
Course Code	CCP401A
Department	Allied Health Science
Faculty	Life And Allied Health Science

### I. Course Summary

#### 1. Aim and Summary

The aim of this course is to give students an experience of addressing a real time problem in cardiac care tech.

The students are expected to work in a team of not more than 4 members and are required to develop an appropriate solution by identifying a problem for which a better or new solution is required. The team need to propose a solution / develop a physical product and write a project report.

#### 2. Course Size and Credits:

Number of credits	10
Total hours of class room interaction during the semester	290
Total number of team members	5
Number of semester weeks	29
Department responsible	Allied Health Science
Course marks	100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

### II. Teaching, Learning and Assessment

#### 3. Course Outcomes (Cos)

After undergoing this course students will be able to:

  
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No.	Course Outcomes
1	Refine the problem in Allied Health Science

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2	Identify appropriate methodology to solve the problem
3	Propose solutions to the problem identified
4	Prepare a project report as per the specified guidelines
5	Presentation of the research finding in an appropriate forum

#### 4. Course Contents

<b>Course Content</b>
Identifying a problem for which a better or new solution is required, through literature review or as defined by Biotechnology experts from Industry
Defining the scope of the problem followed by aim and objectives
Identifying the methodology to meet the objectives
Data collection, analysis and interpretation
Propose solution based on data analysis and interpretation ( Can be a physical product as well)
Preparing/ writing a project report and presentation in appropriate forum

#### 5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in hours
1.	Refining Problem, Aim, Objective & Methodology in concurrence with academic guide	02
2.	Review Plan, design and execution of experiments	20
3.	Data collection, Analysis and Interpretation	20
4.	Discussion with supervisor	06
5.	Propose solution	10
6.	Report presentation	02
<b>Total Duration in Hours</b>		<b>60</b>

#### 6. Method of Assessment

Project component CE	SEE
----------------------	-----

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SC1 (protocol presentation, data collection, Analysis)	SEE
(20+20+20)	40 (Thesis presentation )

### 7. Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Project Work
2.	Understanding	Project Work\ Interaction with Supervisor
3.	Critical Skills	Project Work
4.	Analytical Skills	Project Work
5.	Problem solving Skills	Project Work
6.	Practical Skills	Project Work
7.	Group Work	Project Work
8.	Self-Learning	Project Work
9.	Written Communication Skills	Project Report
10.	Verbal Communication Skills	Examination, Viva-Voce
11.	Presentation Skills	Presentation, Viva-Voce
12.	Behavioral Skills	Project Work
13.	Information Management	Project Report
14.	Personal Management	Project Work
15.	Leadership Skills	

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### 8. Course Resources

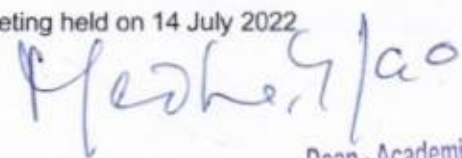
#### a. Essential Reading

1. Gurumani, N., 2006, Research methodology for biological sciences, MJP Publishers.

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**b. Recommended Reading**

1. Gurumani, N., 2010, *Scientific Thesis Writing And Paper Presentation*, 1<sup>st</sup> Edition, MJP Publishers.

**c. Magazines and Journals: -**

**d. Websites**

1. <https://www.ncbi.nlm.nih.gov/pubmed>
2. <https://www.sciencedirect.com/>
3. <https://www.biomedcentral.com/>
4. <http://www.nature.com/>
5. <https://www.cell.com/>

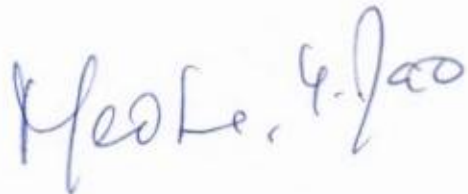
**e. Other Electronic Resources**

1. Journals related to the respective topics of research

**9. Course Organization**

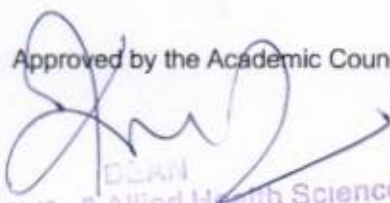
Course Code	CCP401A	
Course Title	RESEARCH PROJECT	
Course Leader/Name	As per timetable	
Course Leader Contact Details	Phone:	080-45366666
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review Date:		

  
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## INTERNSHIP

Course Title	Internship
Course Code	CCI401A
Department	Allied Health Sciences
Faculty	Life and Allied health Sciences

### I. Course Summary

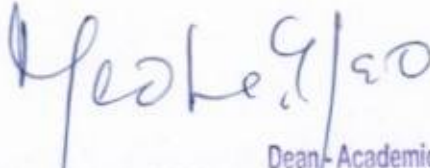
#### 1. Aim and Summary

This internship training deals with postings in various specialty 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 leading to the emergence of trained cardiac care technology.

#### 2. Course Size and Credits:

Number of credits	10
Total hours of internship in an academic semester	290
Number of tutorial hours	NIL
Number of weeks per semester	29
Department responsible	Allied Health Sciences
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

  
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## II. Teaching, Learning an Assessment

### 3. Course Outcomes (Cos)

After undergoing this internship, student will be able to:

No.	Course Outcomes
1	Describe the anatomy of heart, cardiac position , cardiac circulation
2	Discuss techniques of ECG recording, axis duration, and various rhythms
3	Explain principle of 2D imaging and echo views , basic principle of cath lab, radiation safety, vascular access, angiogram , device closure and its management
4	Diagnose and evaluate acute coronary syndrome , HF , arrhythmia and its management, cardiac emergency drugs and its uses
5	Evaluate Ischemic Heart disease, valvular Heart Disease, cardiomyopathy and other cardiac diseases
6	Describe clinical features of valvular Heart Disease and its complication

### 4. Course Contents

Internship:

- (1) Internship is a phase of training where in a student is expected to conduct actual practice and acquires skills under supervision so that he or she may become capable of functioning independently.
- (2) Intern will rotate in the following areas for the duration mentioned in the followingtable.

Sl. No.	Postings	Durationin weeks
1	ECHO	10
2	ECG	1
3	TMT	1
4	HOLTER MONITRING	1
5	DSE/TEE	2

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6	CCU	2
7	CATHLAB	4
8	WARDS	1

**Practicals:**  
 Non invasive Technology; ECG recording  
 basic ECHO evaluation basic  
 Preparation for treadmill test  
 Preparation for 24 hours Holter monitoring  
 Preparation for ABPM

Invasive Technology; Cardiac Cath right  
 Heart Cardiac Cath Left Heart  
 Cardiovascular Angiography  
 Cardiac Pacing

Relevant instrumentation in Cath Lab  
 Cardiac Emergencies in Cath Lab

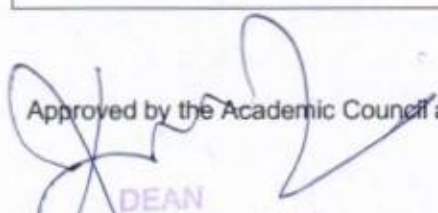
**History taking**  
 Clinical Examination: General Physical Examination and assessment of vital signs  
 Clinical Examination: Basic Systemic Examination  
 Examination  
 .Conversion between different units  
 Identifying the types of medical gas supply and its advantages/disadvantages  
 Devices: Sphygmomanometer, thermometer, pulse oximeter, simple oxygen delivery devices.

Diagnosis of shunts  
 Evaluation of pulmonary hypertension  
 Diagnosis of pericardial constriction  
 Diagnosis of peripheral and aortic diseases  
 Complications of cardiac catheterization  
 Complications and management of Contrast

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### 5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in Hours
<b>Face to Face Lectures</b>		
<b>Demonstrations</b>		
1. Demonstration using Videos		
2. Demonstration using Physical Models/Systems		
3. Demonstration on a Computer		
<b>Numeracy or Tutorials</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital	X	
6. Model Studio		880
<b>Others</b>		
1. Case Study Presentation	X	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
<b>Total Duration in Hours</b>		<b>320</b>

### 6. Method of Assessment

Laboratory components CE	SEE
SC1(Formative laboratory performance assessment/logbook)	SEE
60 Marks	40(OSPE/OSCE)

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### Achieving Learning Outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

SI No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	
2.	Understanding	Clinical postings
3.	Critical Skills	Clinical postings
4.	Analytical Skills	Clinical postings
5.	Problem Solving Skills	Clinical postings
6.	Practical Skills	Clinical postings
7.	Group Work	Clinical postings
8.	Self-Learning	Clinical postings
9.	Written Communication Skills	Patient orders
10.	Verbal Communication Skills	Clinical postings
11.	Presentation Skills	
12.	Behavioral Skills	Clinical postings
13.	Information Management	
14.	Personal Management	Clinical postings
15.	Leadership Skills	Clinical postings

### 7. Course Resources

#### a. Essential Reading:

- Class notes
- A Text book of Electrocardiography - Goldberger.
- Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim

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#### b. Recommended Reading:

- A Text book of Electrocardiography - Goldberger. 2 Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim.
- A Text book of Cardiovascular Medicine. Dr. Bruanwald's.
- A Text book of Medicine. Davidsons.

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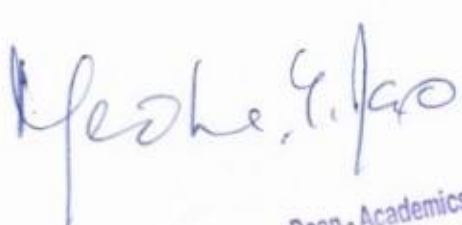


8. Organization

Course Code	19CCT402A
Course Title	INTERNSHIP
Course Teacher/Name	As per the time table
Course Teacher Contact Details	Phone: 080-45366666
	E-mail:
Course Specifications Approval Date	
Next Course Specifications Review Date	

  
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### SEMESTER -8

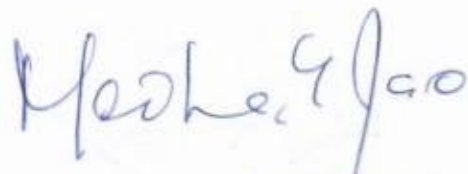
  
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### Course specifications : Research Project

Course Title	RESEARCH PROJECT
Course Code	CCP402A
Department	Allied Health Science
Faculty	Life And Allied Health Science

#### I. Course Summary

##### 1. Aim and Summary

The aim of this course is to give students an experience of addressing a real time problem in cardiac care tech.

The students are expected to work in a team of not more than 4 members and are required to develop an appropriate solution by identifying a problem for which a better or new solution is required. The team need to propose a solution / develop a physical product and write a project report.

##### 2. Course Size and Credits:

Number of credits	10
Total hours of class room interaction during the semester	290
Total number of team members	5
Number of semester weeks	29
Department responsible	Allied Health Science
Course marks	100
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

#### II. Teaching, Learning and Assessment

##### 3. Course Outcomes (COs)

After undergoing this course students will be able to:

No.	Course Outcome
1.	Refine the problem in Allied Health Science
2.	Identify appropriate methodology to solve the problem

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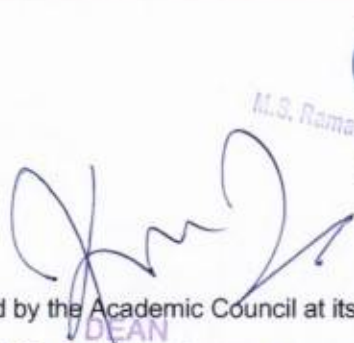
3.	Propose solutions to the problem identified
4.	Prepare a project report as per the specified guidelines
5.	Presentation of the research finding in an appropriate forum

#### 4. Course Contents

<b>Course Content</b>
Identifying a problem for which a better or new solution is required, through literature review or as defined by Biotechnology experts from Industry
Defining the scope of the problem followed by aim and objectives
Identifying the methodology to meet the objectives
Data collection, analysis and interpretation
Propose solution based on data analysis and interpretation ( Can be a physical product as well)
Preparing/ writing a project report and presentation in appropriate forum

#### 5. Course Teaching and Learning Methods

Teaching and Learning Methods		Duration in hours
7.	Refining Problem, Aim, Objective & Methodology in oncurrance with academic guide	02
8.	Review Plan, design and execution of experiments	20
9.	Data collection, Analysis and Interpretation	20
10.	Discussion with supervisor	06
11.	Propose solution	10
12.	Report presentation	02
<b>Total Duration in Hours</b>		<b>60</b>

  
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### 6. Achieving learning outcomes

Project component CE	SEE
SC1 (protocol presentation, data collection, Analysis)	SEE
(20+20+20)	40 (Thesis presentation )

### 7. Achieving Learning Outcomes

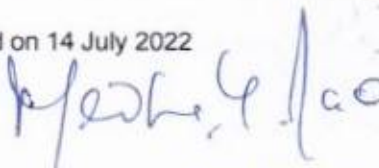
The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

Sl. No	Curriculum and Capabilities Skills	How imparted during the course
1.	Knowledge	Project Work
2.	Understanding	Project Work\ Interaction with Supervisor
3.	Critical Skills	Project Work
4.	Analytical Skills	Project Work
5.	Problem solving Skills	Project Work
6.	Practical Skills	Project Work
7.	Group Work	Project Work
8.	Self-Learning	Project Work
9.	Written Communication Skills	Project Report
10.	Verbal Communication Skills	Examination, Viva-Voce
11.	Presentation Skills	Presentation, Viva-Voce
12.	Behavioral Skills	Project Work

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13.	Information Management	Project Report
14.	Personal Management	Project Work
15.	Leadership Skills	

## 8. Course Resources

### a. Essential Reading

- Gurumani, N., 2006, Research methodology for biological sciences, MJP Publishers.

### b. Recommended Reading

- Gurumani, N., 2010, Scientific Thesis Writing And Paper Presentation, 1st Edition, MJP Publishers.

### c. Magazines and Journals

### d. Websites

- <https://www.ncbi.nlm.nih.gov/pubmed>
- <https://www.sciencedirect.com/>
- <https://www.biomedcentral.com/>
- <http://www.nature.com/>
- <https://www.cell.com/>

### e. Other Electronic Resources

- Journals related to the respective topics of research

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## 9. Course Organization

Course Code	CCP402A	
Course Title	RESEARCH PROJECT	
Course Leader/Name	As per timetable	
Course Leader Contact Details	Phone:	080-45366666
	E-mail:	
Course Specifications Approval Date		
Next Course Specifications Review Date:		

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### Course specifications : Internship

Course Title	Internship
Course Code	CCI402A
Department	Allied Health Sciences
Faculty	Life and Allied health Sciences

#### I. Course Summary

##### 1. Aim and Summary

This internship training deals with postings in various specialty 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 leading to the emergence of trained cardiac care technology.

##### 2. Course Size and Credits

Number of credits	10
Total hours of internship in an academic semester	290
Number of tutorial hours	NIL
Number of weeks per semester	29
Department responsible	Allied Health Sciences
Pass requirement	As per Academic Regulations
Attendance requirement	As per Academic Regulations

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## II. Teaching, Learning and Assessment

### 3. Course Outcomes (COs)

After undergoing this internship, student will be able to:

No.	Course Outcomes
1	Describe the anatomy of heart, cardiac position , cardiac circulation
2	Discuss techniques of ECG recording, axis duration, and various rhythms
3	Explain principle of 2D imaging and echo views , basic principle of cath lab,radiation safety, vascular access, angiogram , device closure and its management
4	Diagnose and evaluate acute coronary syndrome, HF , arrhythmia and its management, cardiac emergency drugs and its uses.
5	Evaluate Ischemic Heart disease, valvular Heart Disease, cardiomyopathy and other cardiac diseases
6	Describe clinical features of valvular Heart Disease and its complication

### 4. Course Contents

#### Internship:

Internship is a phase of training where in a student is expected to conduct actual practice and acquires skills under supervision so that he or she may become capable of functioning independently.

Intern will rotate in the following areas for the duration mentioned in the following table.

Sl. No.	Postings	Duration in weeks
1	ECHO	10
2	ECG	1
3	TMT	1
4	HOLTER MONITRING	1
5	DSE/TEE	2
6	CCU	2

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7	CATHLAB	4
8	WARDS	1

**Practicals:**

- Non invasive Technology; ECG recording basic ECHO evaluation basic
- Preparation for treadmill test
- Preparation for 24 hours Holter monitoring Preparation for ABPM
- Invasive Technology; Cardiac Cath right Heart Cardiac Cath Left Heart Cardiovascular Angiography Cardiac Pacing
- Relevant instrumentation in Cath Lab Cardiac Emergencies in Cath Lab

**History taking**

- Clinical Examination: General Physical Examination and assessment of vital signs  
Clinical Examination: Basic Systemic Examination
- Conversion between different units
- Identifying the types of medical gas supply and its advantages/disadvantages
- Devices: Sphygmomanometer, thermometer, pulse oximeter, simple oxygen delivery devices.
- Diagnosis of shunts
- Evaluation of pulmonary hypertension Diagnosis of pericardial constriction  
Diagnosis of peripheral and aortic diseases Complications of cardiac catheterization Complications and management of Contrast

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**5. Course Teaching and Learning Methods**

Teaching and Learning Methods	Duration in Hours
Face to Face Lectures	
Demonstrations	
1. Demonstration using Videos	
2. Demonstration using Physical Models/Systems	

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3. Demonstration on a Computer		
<b>Numeracy or Tutorials</b>		
1. Solving Numerical Problems		
<b>Practical Work</b>		
1. Course Laboratory		
2. Computer Laboratory		
3. Engineering Workshop/Course Workshop/Kitchen		
4. Clinical Laboratory		
5. Hospital	X	880
6. Model Studio		
<b>Others</b>		
1. Case Study Presentation	X	
2. Guest Lecture		
3. Industry/Field Visit		
4. Brain Storming Sessions		
5. Group Discussions		
6. Discussing Possible Innovations		
<b>Total Duration in Hours</b>		<b>320</b>

#### 6. Method of Assessment

Laboratory components CE	SEE
SC1(Formative laboratory performance assessment/logbook)	SEE
60 Marks	40(OSPE/OSCE)

#### 7. Achieving learning outcomes

The following skills are directly or indirectly imparted to the students in the following teaching and learning methods:

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Sl No	Curriculum and Capabilities	How imparted during the course
1.	Knowledge	

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2.	Understanding	Clinical postings
3.	Critical Skills	Clinical postings
4.	Analytical Skills	Clinical postings
5.	Problem Solving Skills	Clinical postings
6.	Practical Skills	Clinical postings
7.	Group Work	Clinical postings
8.	Self-Learning	Clinical postings
9.	Written Communication Skills	Patient orders
10.	Verbal Communication Skills	Clinical postings
11.	Presentation Skills	
12.	Behavioural Skills	Clinical postings
13.	Information Management	
14.	Personal Management	Clinical postings
15.	Leadership Skills	Clinical postings

#### 8. Course Resources

- **Essential Reading**

- Class notes
- A Text book of Electrocardiography - Goldberger.
- Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim

- **Recommended Reading:**

- A Text book of Electrocardiography - Goldberger. 2 Nanda's A Text book of Echocardiography.
- A Text of Cardiac Catheterization & Interventions. Dr. W. Grossman's D. Baim.
- A Text book of Cardiovascular Medicine. Dr. Bruanwald's.
- A Text book of Medicine. Davidsons.

#### 9. Course Organization

  
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<b>Course Code</b>	CCP402A
<b>Course Title</b>	INTERNSHIP
<b>Course Teacher/Name</b>	As per the time table
<b>Course Teacher Contact Details</b>	Phone: 080-45366666
	E-mail:
<b>Course Specifications Approval Date</b>	
<b>Next Course Specifications Review Date</b>	

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