

Syllabus for ECG Technician Assistant

Course Name	ECG Technician Assistant
Course Code	<i>STC - HLC /2023/1613</i>
Sector	<i>Healthcare (Paramedical)</i>
Course Level	<i>3</i>
Occupation	<i>Assistant to ECG Technician</i>
Job Description	The ECG Technician Assistant plays a vital role in our healthcare team, bridging the gap between medical professionals and patients in the assessment and management of cardiac conditions. With a strong foundation in human anatomy, histology, and cardiovascular anatomy, this role involves assisting in ECG procedures, cardiac anomaly identification, and the assessment of cardiac function using specialized methods such as thermodilution and pulse Doppler. Proficiency in ECG procedures, accurate interpretation of ECG tracings, and adherence to ethical and professional standards are paramount.
Course Duration	<i>720 hrs(Th. 150Hrs, Prac. 330Hrs, ES 60Hrs, OJT. 180 Hrs at Medium Laboratory / at 30 or more bedded hospital with facility of relevant training. OJT will be for a period of not less than 3 months.</i>
Trainees' Entry Qualification	Class X Pass Out
Trainers Qualification	Trainers already registered with West Bengal Allied & Paramedical Council in relevant training module OR Post Graduate from relevant allied Healthcare / Medical Lab Technology with relevant experience OR Doctors with MD/MBBS/BHMS/BAMS with relevant experience. <i>Post Graduate of relevant Allied Healthcare Community will be preferred.</i>

Structure of Course:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) (in multiple of 30 each)
1	Introduction to Anatomy	Explain basics of human anatomy, histology, and cardiovascular anatomy	30	60	90
2	Cardiac Physiology and Clinical Application	Assist in assessing cardiac function using methods such as thermodilution and pulse Doppler as well as in managing cardiac patients within an ICCU setting	40	80	120
3	Cardiovascular	Assist in ECG procedures and cardiac anomaly identification, supporting	40	80	120

	Diseases and Disorders	medical professionals in diagnosing and managing heart conditions.			
4	ECG Fundamentals and Practical Application	Demonstrate proficiency in conducting ECG procedures, interpreting ECG tracings, and accurately assessing cardiac rhythms.	30	90	120
5	Medical Ethics	Apply ethical principles, legal guidelines, and professional values to ensure patient rights, uphold ethical standards, and maintain professionalism.	10	20	30
6	Employability Skill		60		60
7	OJT	At Medium Laboratory / at 30 or more bedded hospital with facility of relevant training. OJT will be for a period of not less than 3 months.		180	180
TOTAL:			210	510	720

SYLLABUS:

Module No. 1: Introduction to Anatomy

Module Outcome: Explain basics of human anatomy, histology, and cardiovascular anatomy

Theory Content:

Introduction to Anatomy

Definition and importance of anatomy.

Historical overview of anatomical studies.

Branches of anatomy: Gross anatomy, Microscopic anatomy, and Developmental anatomy.

Anatomical terminology: Anatomical position, planes, axes, and directional terms.

Osteology

Upper limb bones: Clavicle, scapula, humerus, radius, ulna.

Lower limb bones: Femur, hip bone, sacrum, tibia, fibula.

Vertebral column: Types of vertebrae and their characteristics.

Thoracic Anatomy

Thorax: Intercostal spaces, pleura, and bony thoracic cage.

Ribs, sternum, and thoracic vertebrae.

Lungs: Trachea, bronchial tree, and pulmonary circulation.

Cardiovascular Anatomy

Heart: Surface and gross anatomy of the heart.

Heart chambers: Atria and ventricles.

Valves of the heart: Atrioventricular valves and semilunar valves.

Major blood vessels of the heart: Aorta, pulmonary trunk, superior and inferior vena cava.
Pericardium: Layers and function.
Coronary arteries: Supply to the heart muscle.
Pulmonary circulation: Blood flows to and from the lungs.
Venous system: Venous drainage of the heart.

Myology

Muscles of the thorax.
Muscles of the upper limb: Arm and forearm muscles.
Flexor and extensor groups of muscles: Origin, insertion, nerve supply, and actions.

Histology

Types of tissues: Epithelial tissue - Squamous, Glandular, Transitional.
Cartilage: Types and characteristics.
Connective tissue: Bone, fibrous tissue, muscle.
Excretory system: Kidney, ureters, bladder, and structure of nephrons.

Practical Content:

Heart Dissection and Identification

Heart cut section: Identification of structures within the heart.
Gross anatomy of the heart: Location, chambers, and major blood vessels.
Identification of heart valves and their functions.
Study of atherosclerosis in heart vessels.

Histology

Slides for identification of different tissues.
Microscopic examination of heart muscle tissue.
Observation and description of tissue changes in atherosclerosis.
Examination of kidney sections and nephron structure.

Tools & Equipment requirement

Anatomy lab with dissection tables.
Cadaver specimens or anatomical models for practical demonstrations.
Microscopes and prepared histology slides.
Dissection instruments (scalpels, scissors, forceps, etc.).
Skeleton models or bone specimens for osteology.
Relevant textbooks and anatomical atlases.
Audiovisual aids for lectures and presentations.

Module No. 2: Cardiac Physiology and Clinical Application

Module Outcome: Assist in assessing cardiac function using methods such as thermodilution and pulse Doppler as well as in managing cardiac patients within an ICCU setting

Theory Content:

Overview of the Cardiovascular System

Functions of the cardiovascular system.

Circulation of blood.

Central control of the cardiovascular system.

Cardiac Cycle

Mechanical events in the cardiac cycle.

Arterial cycle and central venous pressure cycle.

Clinical aspects of the human cardiac cycle.

Cardiac Excitation and Contraction

Mechanism of cardiac muscle contraction.

Function of the sinoatrial node.

The cardiac conduction system: Atrioventricular node function.

Autonomic regulation of heart rate.

Assessment of Cardiac Output

Fick principle.

Thermodilution and indicator dilution methods.

Pulse Doppler methods.

Miscellaneous methods.

Hemodynamics

Relationship between pressure, flow, and resistance.

Frank-Starling law.

Preload, afterload, and contractility.

Control of stroke volume and cardiac output.

Solute Transport between Blood and Tissues

Circulation of fluid between plasma, interstitium, and lymph.

Vascular Smooth Muscle

Mechanism of smooth muscle contraction.

Pharmacomechanical coupling.

Automaticity.

Control of Blood Vessels

Local control mechanisms.

Nervous control.

Hormonal control.

Specialization in Individual Circulation

Coronary circulation.

Cerebral circulation.

Pulmonary circulation.

Cutaneous circulation.

Cardiovascular Receptors, Reflexes, and Central Control

Coordinated Cardiovascular Responses

Posture.

Valsalva maneuver.

Exercise.

Diving reflex.

Cardiovascular Responses in Pathological Situations

Shock and hemorrhage.

Syncope.

Essential hypertension.

Chronic cardiac failure.

Respiratory Physiology

Mechanics of respiration.

Principles of gas exchange.

Regulation of respiration.

Hematology and Coagulation Physiology

Blood components.

Blood groups and blood transfusion.

Hemostasis.

Practical Content:

Thermodilution and Indicator Dilution Methods:

Hands-on practice with thermodilution and indicator dilution techniques for measuring cardiac output.

Calibration and use of equipment for accurate measurements.

Pulse Doppler Methods and Miscellaneous Methods:

Training in utilizing pulse Doppler methods for assessing blood flow and cardiac function.

Introduction to various miscellaneous methods for evaluating cardiac parameters.

Control of Stroke Volume and Cardiac Output:

Practical exercises demonstrating the factors influencing stroke volume and cardiac output, including preload, afterload, and contractility.

Working on ICCU Setup:

Practical experience in working within an Intensive Cardiac Care Unit (ICCU) setup.

Observation and hands-on practice with monitoring and assisting in the management of cardiac patients.

Module No. 3: Cardiovascular Diseases and Disorders

Module Outcome: Assist in ECG procedures and cardiac anomaly identification, supporting medical professionals in diagnosing and managing heart conditions.

Theory Content:

1. Valvular Heart Disease

Etiology of acquired valvular heart disease.

Rheumatic fever and rheumatic heart disease.

Specific valvular conditions: Aortic stenosis, Aortic regurgitation, Mitral valve disease, Mitral

stenosis, Mitral regurgitation, Combined valvular heart disease, Tricuspid valve disease.

Infective endocarditis.

Valvuloplasty and valve surgery.

2. Coronary Artery Disease

Pathophysiology and clinical recognition.

Angina Pectoris.

Symptomatic and asymptomatic myocardial ischemia.

Types and locations of myocardial infarction.

Thrombolytic therapy.

Cardiac rehabilitation.

3. Systemic Hypertension

Essential and secondary hypertension.

4. Heart Failure

Surgical and medical treatment.

5. Myocardial Diseases

Dilated cardiomyopathy.

Hypertrophic cardiomyopathy.

Restrictive cardiomyopathy.

Myocarditis.

6. Pericardial Diseases

Pericardial effusion.

Constrictive pericarditis.

7. Electrical Disturbances of the Heart

Sinus node dysfunction.

Arrhythmias and conduction disturbances.

8. Pulmonary Hypertension

Primary pulmonary hypertension.

Pulmonary thromboembolism.

9. Peripheral Vascular Disease

Atherosclerotic peripheral vascular disease.

Aortic aneurysms.

Aortic dissection.

Takayasu arteritis.

10. Congenital Heart Disease

Cyanotic heart disease: Atrial septal defect, Ventricular septal defect, Patent ductus arteriosus, Congenital valvular disease, Coarctation of aorta.

Cyanotic congenital heart disease: Pulmonary atresia, Transposition of great arteries, Total anomalous pulmonary venous connection.

Practical Content:

1. Pathophysiology and Clinical Recognition

- Practicing the clinical recognition of cardiovascular diseases.
- Diagnostic procedures and tests for identifying cardiac conditions.
- Interpretation of diagnostic reports and imaging studies.

2. Angina Pectoris, Myocardial Ischemia, and Infarction

- Simulated scenarios for managing patients with angina pectoris.
- Hands-on training in administering medications for symptomatic and asymptomatic myocardial ischemia.
- Practical exercises on identifying and managing different types and locations of myocardial infarction.
- Training in the administration of thrombolytic therapy.
- Cardiac rehabilitation techniques and exercises.

3. Surgical and Medical Treatment

- Demonstration on surgical interventions for heart failure, including valve repair/replacement and coronary artery bypass grafting.
- Medication administration and monitoring for heart failure patients.
- Simulated scenarios involving the management of patients with myocardial diseases, such as dilated cardiomyopathy, hypertrophic cardiomyopathy, and myocarditis.

4. Working on ICCU Setup

- Realistic ICCU setup experiences to develop practical skills in a clinical environment.
- Monitoring and care of patients with cardiovascular diseases within an intensive care unit.
- Collaboration with healthcare professionals in a team-based approach.
- Handling emergency situations and responding to critical cardiac events.

Tools & Equipment requirement

Diagnostic Equipment:

Electrocardiogram (ECG) machines.

Echocardiography machines.

Stress testing equipment.

Blood pressure monitors.

Stethoscopes and sphygmomanometers.

Simulated Patient Models:

Simulated patient manikins with cardiac features for practicing clinical examinations and procedures.

ICCU Setup:

An Intensive Cardiac Care Unit (ICCU) setup with monitoring equipment, including cardiac monitors, ventilators, and defibrillators.

ICCU beds and monitoring stations.

Cardiac pathology models and charts for visual learning.

Exercise and Rehabilitation Equipment:

Treadmills and exercise bikes for cardiac rehabilitation training.

Resistance bands and weights for strength training.

Personal Protective Equipment (PPE):

Gloves, masks, and gowns for infection control during practical sessions.

Audiovisual Aids:

Multimedia resources for enhancing the learning experience, including video demonstrations and interactive software.

Module No. 4: ECG Fundamentals and Practical Application

Module Outcome: Demonstrate proficiency in conducting ECG procedures, interpreting ECG tracings, and accurately assessing cardiac rhythms.

Theory Content:

1. Fundamental Principles of Electrocardiography
 - Introduction to ECG and its significance in cardiology.
 - Basics of electrical conduction in the heart.
2. Cardiac Electrical Field Generation
 - Cardiac electrical activation during depolarization.
 - Cardiac wavefronts and their propagation.
3. Cardiac Electrical Field Generation During Ventricular Recovery
 - Electrical events during ventricular repolarization.
 - The role of ion channels in repolarization.
4. Electrocardiographic Lead Systems
 - Types of lead systems used in ECG recording.
 - Standard limb leads and their orientation.
 - Precordial leads and the Wilson central terminal.
 - Augmented limb leads and their significance.
5. The Hexaxial Reference Frame and Electrical Axis
 - Understanding the concept of electrical axis.
 - Interpretation of electrical axis deviations.
6. Recording Adult and Paediatric ECGs
 - Techniques and considerations for obtaining ECG recordings in both adult and paediatric patients.
7. The Normal Electrocardiogram
 - Interpretation of a normal ECG tracing.
 - Identification of different ECG waves and intervals.
8. Atrial Activation
 - Analysis of atrial depolarization and its representation on the ECG.

- Normal P wave characteristics.
- 9. Atrial Repolarization
 - Understanding atrial repolarization on the ECG.
 - Correlation with the T wave.
- 10. Atrioventricular Node Conduction and the PR Segment
 - Overview of atrioventricular (AV) node conduction.
 - Interpretation of the PR segment.
- 11. Ventricular Activation and the QRS Complex
 - Analysis of ventricular depolarization.
 - Identification of QRS complex components.
- 12. Ventricular Recovery and ST-T Wave
 - Understanding ventricular repolarization.
 - Interpretation of the ST segment and T wave.
- 13. U Wave and Normal Variants
 - Discussion of U wave morphology and its significance.
 - Recognition of normal ECG variants.
- 14. Rate and Rhythm
 - Calculation of heart rate.
 - Interpretation of different cardiac rhythms.

Practical Content:

1. Learning Steps and Procedure of ECG
 - Step-by-step guidance on conducting ECG procedures.
 - Proper electrode placement and patient preparation.
2. Understanding Rhythm, Rates, and Waves
 - Practical exercises in ECG interpretation.
 - Identifying cardiac rhythms, heart rates, and ECG waveforms.

Tools & Equipment Requirement:

- ECG machine for practical training.
- Access to emergency and ICCU setups for real-world scenario practice and application of ECG skills.

Module No 5: Medical Ethics

Course Outcome:

Apply ethical principles, legal guidelines, and professional values to ensure patient rights, uphold ethical standards, and maintain professionalism.

Theory:

1: Introduction to Medical Ethics

Differentiating between medical ethics and medical law, defining their goals and scope.

Understanding the healthcare Code of Conduct.

Exploring basic medical ethics principles, with an emphasis on confidentiality.

Providing an overview of malpractice and negligence, including rational and irrational drug therapy.

2: Ethics and Practice

Upholding patients' rights by understanding and implementing autonomy and informed consent.
Ethical considerations in caring for terminally ill patients.
Distinguishing medical diagnosis from physiotherapy diagnosis.
Exploring the medico-legal aspects of medical records, including types of medico-legal cases, record-keeping, ownership, confidentiality, release of information, unauthorized disclosure, and retention.

3: Protocol & Principles

Understanding professional indemnity through insurance policies.
Developing standardized protocols to prevent near misses or sentinel events.
The process of obtaining informed consent.
Exploring biomedical ethical principles.
Discussing the code of ethics for para-medical staff.

4: Professionalism & Values

Understanding and actively applying professional values such as integrity, objectivity, competence, due care, and confidentiality.
Embracing core values in healthcare, including accountability, altruism, compassion, excellence, integrity, professional duties, and social responsibility.
Recognizing the ethical significance of personal values.
Demonstrating appropriate attitudes and behaviors in healthcare, including professionalism and treating all individuals equally.
Examining the code of conduct, professional accountability, responsibility, and addressing misconduct.
Recognizing the differences between professions and emphasizing the importance of teamwork in healthcare.
Considering cultural factors in the healthcare environment.
Understanding the role of entry-level healthcare practitioners, their autonomy, and their commitment to evidence-based practice.

Practical Syllabus:

1. Practical activities related to each topic, including case studies, role-playing, and discussions to apply ethical principles and legal guidelines in real-world healthcare scenarios.
2. Hands-on exercises in developing protocols, obtaining informed consent, and addressing ethical dilemmas.
3. Interactive sessions to explore biomedical ethical principles and their application in healthcare practice.
4. Ethical decision-making simulations and discussions on code of conduct.
5. Collaborative exercises emphasizing teamwork and cultural sensitivity in healthcare settings.
6. Practical demonstrations of handling medical records, ensuring confidentiality, and addressing medico-legal aspects.
7. Visits to healthcare facilities to observe and discuss real-world applications of medical ethics and professionalism.
8. Role-playing and case studies focused on patient interactions, informed consent, and ethical dilemmas.

9. Group discussions and activities to foster a deeper understanding of personal and professional values and their impact on healthcare practice.

Module No 6: Employability Skill (60 Hrs)

Key Learning Outcomes

Introduction to Employability Skills

Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship

Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century

Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills

Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting

Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills

Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion

Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy

Duration: 5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills

Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship

Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service

Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs

Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Module No. 7: OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain.

(OJT to be completed at Medium Laboratory / at 30 or more bedded hospital with facility of relevant training. OJT will be for a period of not less than 3 months.)

List of Tools, Equipment & materials needed for 30 Trainees (Practical)

No.	Name of Equipment	Quantity
1	Cardiac Cath Lab Equipment with Accessories	1 no
2	Defibrillator	1 no
3	Blood Gas Analyser & Blood/Oxymeter	1 no
4	ECG Machine	1 no
5	Ventilator	2 nos
6	Sterilizer Equipment	2 nos
7	Infusion Pump	1no
8	Emergency Medicine Crash Trolley	1 no

OJT. 180 Hrs at Medium Laboratory / at 30 or more bedded hospital with facility of relevant training. OJT will be for a period of not less than 3 months.

Marks Distribution

Outcome	Outcome Code	Total Th Marks	Total Pr Marks
Explain basics of human anatomy, histology, and cardiovascular anatomy	HLC/1613/OC1	30	70
Assist in assessing cardiac function using methods such as thermolulution and pulse Doppler as well as in managing cardiac patients within an ICCU setting	HLC/1613/OC2	40	110
Assist in ECG procedures and cardiac anomaly identification, supporting medical professionals in diagnosing and managing heart conditions.	HLC/1613/OC3	40	110
Demonstrate proficiency in conducting ECG procedures, interpreting ECG tracings, and accurately assessing cardiac rhythms.	HLC/1613/OC4	30	150
Apply ethical principles, legal guidelines, and professional values to ensure patient rights, uphold ethical standards, and maintain professionalism.	HLC/1613/OC5	10	60
OJT	HLC/1613/OC10	0	300
Employability Skill-60 Hrs	DGT/VSQ/N0102	50	0