



Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Bachelor of Vocation

B.Voc. Medical Equipment Technology

SYLLABUS

(For Students admitted during 2024 - 25)



Avinashilingam Institute for Home Science and Higher Education for Women

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Coimbatore - 641 043, Tamil Nadu, India

Department of Biomedical Instrumentation Engineering

B. Voc Medical Equipment Technology

Programme Outcomes:

- 1. Disciplinary Knowledge** - Demonstrate and apply the knowledge gained related to diagnosis and therapy equipment.
- 2. Communication Skills** – Understand the art of effective communication with various stakeholders like patients, patient family, nurses, etc.
- 3. Critical Thinking** - Analyze and evaluate concepts related to design of system components or processes that meet the specified needs with appropriate consideration for the public health and safety.
- 4. Problem Solving** - Understand the prevailing problems in real life situations of fault-finding techniques & to suggest preventive measures & safety
- 5. Cooperation/Team work** - Inquire unique skills to form teams and facilitate them to work towards the specified goals.
- 6. Research-related Skills** – Select, analyze, and use computer and networking systems (hardware and software) in the design, development and implementation of medical equipment to enhance functionality.
- 7. Scientific Reasoning** – Demonstrate principles of troubleshooting and logical diagnosis by using critical thinking skills to define, analyze, and implement a solution.
- 8. Reflective Thinking** - Compare and understand the eco standards and use them to ensure that biomedical equipment is operating to institutional, national, and manufacturers' specifications.
- 9. Information/digital Literacy** - Express the applications of the recent developments to articulate basic knowledge to relevant data to enhance the activities to maintain the medical equipment fully functioning and always maintained.
- 10. Self – Directed learning** – Develop students' creative thinking and reasoning skills to manage and create professional opportunities in the health sector.
- 11. Lifelong Learning** - Apply and utilize the acquired creative skills and critical thinking to ensure that all biomedical equipment is in proper working condition, ensuring a safe, reliable health care environment.

Programme Specific Outcomes:

1. Ability to ensure that medical equipment is well-maintained and safely functional.
2. Follow safety code and standards, troubleshoot faulty device and achieve appropriate skills for employment

Scheme of Instruction & Examination
(For students admitted from 2024 – 25 & onwards)

Part	Course Code	Name of course/component	Hours of Instruction/week		Scheme of Examination				
			Theory	Practical/ Field work	Duration of exam	CIA	CE	Total	Credit
		First Semester							
I		Language							
	24VLEN01	Communicative English	2	2/0	3	50	50	100	3
II		Core Courses							
	24VMTC01	Anatomy and Physiology	2	2/0	3	50	50	100	3
	24VMTC02	Fundamentals of Biomedical Instrumentation	2	2/0	3	50	50	100	3
	24VMTC03	Basic Electrical and Electronics Engineering	2	2/0	3	50	50	100	3
III		Skill Training							
	24VMTS01	Skill Training in Industry-I (NSQF Level 4)	8	0/20	3	50	50 (SSC)	100	18
IV		Non-Credit Mandatory Courses							
	24BVNSS1	NSS – I				100	-	100	Remarks
		Second Semester							
I		Language							
	24VLEN02	Professional English	2	2/0	3	50	50	100	3
II		Core Courses							
	24VMTC04	Computer Fundamentals	2	2/0	3	50	50	100	3
	24VMTC05	Concept of Health and Medical Terminology	2	2/0	3	50	50	100	3
	24VMTC06	Microprocessor and its Applications	2	2/0	3	50	50	100	3
III		Skill Training							
	24VMTS02	Skill Training in Industry-II (NSQF Level 5)	8	0/20	3	50	50 (SSC)	100	18
IV		Non-Credit Mandatory Courses							
	24BVNSS2	NSS – II				100	-	100	Remarks
		Third Semester							
II		Core Courses							
	24VMTC07	Diagnostic and Therapeutic Equipment	3	2/0	3	50	50	100	4
	24VMTC08	Electrotherapy and Physiotherapy Equipment	3	2/0	3	50	50	100	4
	24VMTC09	ICU and Operation Theatre Equipment	3	2/0	3	50	50	100	4
III		Skill Training							
	24VMTS03	Hospital Standards and Policies	4	10/0	3	50	50	100	9
	24VMTS04	Skill Training in Hospital-I	4	0/10	3	50	50	100	9
IV		Non-Credit Mandatory Courses							
	24BVNSS3	NSS – III				100	-	100	Remarks

Part	Course Code	Name of course/component	Hours of Instruction/week		Scheme of Examination				
			Theory	Practical/ Field work	Duration of exam	CIA	CE	Total	Credit
		Fourth Semester							
II		Core Courses							
	24VMTC10	Hospital Information System	3	2/0	3	50	50	100	4
	24VMTC11	Life Support Device	3	2/0	3	50	50	100	4
	24VMTC12	Radiology and Medical Imaging	3	2/0	3	50	50	100	4
III		Skill Training							
	24VMTS05	Quality in Healthcare	4	10/0	3	50	50	100	9
	24VMTS06	Skill Training in Hospital-II(NSQF Level 6)	4	0/10	3	50	50 (SSC)	100	9
IV		Non-Credit Mandatory Courses							
	24BVNSS4	NSS – IV				100	-	100	Remarks
		Fifth Semester							
II		Core Courses							
	24VMTC13	Telehealth Technology	3	2/0	3	50	50	100	4
III		Skill Training							
	24VMTS07	Troubleshooting of Medical Equipment	6	11/0	3	50	50	100	12
	24VMTS08	Skill Training in Hospital-III	6	0/11	3	100	100	200	12
	24VMTS09	Mini Project	-	0/3	3	100	-	100	2
IV		Non-Credit Mandatory Courses							
	24BVNSS5	NSS – V				100	-	100	Remarks
		Sixth Semester							
II		Core Courses							
	24VMTC14	Hospital System Management	3	2/0	3	50	50	100	4
III		Skill Training							
	24VMTS10	Testing, Calibration and Maintenance of Medical Equipment	6	7/0	3	50	50	100	10
	24VMTS11	Skill Training in Hospital-IV(NSQF Level 7)	6	0/7	3	100	100 (SSC)	200	10
	24VMTS12	Project Work	-	0/12	3	100	100	200	6
IV		Non-Credit Mandatory Courses							
	23BVBNS6	NSS – VI				100	-	100	Remarks

Exit Levels	NSQF Level	Credits earned	Award
At the end of I Semester	4	30	Certificate
At the end of I Year	5	30+30	Diploma
At the end of II Year	6	60+60	Advanced Diploma
At the end of III Year	7	60+60+60	B. Voc Degree
	Total credits	180	

Communicative English

Semester I
24VLEN01

Hours of Instruction/week: 2T+2P

No. of credits: 3

Objectives:

- To facilitate among student's fluency in spoken and written English.
- To give exposure to technical writing in English.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Listen actively and comprehend the meaning
- CO2** : Make presentation individually or in groups
- CO3** : Use appropriate words in conversation
- CO4** : Gain knowledge in writing skills
- CO5** : Develop effective communicative skills

Unit I Listening

6

Listening for general information, comprehending intended meaning, understanding inferred meaning, trying to listen for specific purposes.

Unit II Presentation

6

Description of an experience, Item or place individually or in groups, Preparing PPTs and explaining the key points.

Unit III Reading

6

Reading for general and specific purposes, both silent and loud reading, understanding words usage, learning to use those words in conversations and in writing.

Unit IV Writing

6

Writing paragraphs, Notices, Official letters, Reports, E-mails, understanding writing etiquettes, Making outlines and summaries, Online marketing techniques.

Unit V Language Focus

6

Tenses, Prefixes, Suffixes, Verb usage, Sentence construction, Affirmative and negative sentences, Subject verb congruence, using right words in the right place and Learning pronunciation techniques.

Practicals:

Total Hours: 30

1. Listening comprehension exercise through Globarene Software.
2. Preparation and presentation of PPT on specific topics.
3. Reading articles from newspaper clippings.
4. Writing leave/official letter, resume.
5. Pronunciation correction, Sentence correction through reading exercises.

Total Hours: 30

Reference books:

1. *Nitin Bhatnagar and Mamta Bhatnagar, (2010), Communicative English for Engineers and Professionals.*
2. *Mandal (2006), Effective Communication and Public Speaking,* Jaico Publishing House.
3. *Sudharani.D (2011), Advanced Communication Skills Lab.* Pearson Education.
4. *Diana Hopkins and Pauline Cullen Cambridge UP (2007), Grammar for IELTS with answers,* New Delhi.

Anatomy and Physiology

Semester I
24VMTC01

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To impart fundamental knowledge about the anatomy and physiology of the different systems of the human body.

UNIT I Introduction to Human Cell, Blood

6

Cell - Types, Structure, organelles and its functions, Membrane – transport across membrane, Origin of cell membrane potential, Action potential and propagation, Blood Composition - RBC, WBC and Platelets, Blood groups and its importance.

UNIT II Cardiovascular and Respiratory System

6

Anatomy of heart, vascular system and circulation, Electrical conduction system, Cardiac Cycle, Electrocardiogram, Cardiac Output, Blood Pressure, Heart sounds. Anatomy of lungs, Mechanics of breathing, O₂ and CO₂ transport, Lung volumes and Capacities, TLC graph, Respiratory insufficiency and its types.

UNIT III Digestive and Excretory System

6

Organs of the Digestive system, Movement in Stomach, Small Intestine and GI Tract and factors regulating the movement, Defecation, Structure and functions of the kidney, Nephron, physiology of urine formation, Micturition, Regulation of acid base balance.

UNIT IV Nervous System and Muscular System

6

Nerve cell, Functions of the nervous system, Conduction of nerve impulse, CNS, Neuron and Neurotransmitters, Brain Anatomy, Spinal cord, PNS, Reflex Action, Electroencephalogram. Muscle Tissue- Structure & Types, Types of Joints, Major Muscles of Limbs and their actions, Electromyogram.

UNIT V Endocrine Glands and Special Organs

6

Endocrine glands, Pituitary, Thyroid & Parathyroid glands, Secretions, Maintenance of Calcium & glucose homeostasis. Eye structure - Visual Pathway. Ear structure - External, Internal, Auditory pathway, Mechanism of Hearing. Audiogram. Sense of taste, smell, touch.

Total Hours: 30

Practicals:

1. Study of human skeleton
2. Study of respiratory system with charts and models
3. To identify parts of gastrointestinal system with charts and models
4. Study of central nervous system with charts and models
5. Study of human eye with charts and models
6. Study of human ears with charts and models

Total Hours: 30

Reference books:

1. *Ellen. N Marieb (2007), Essentials of Human Anatomy and Physiology*, Eighth Edition Pearson Education, New Delhi.
2. *Arthur C. Guyton & John E. Hall (2006), TextBook of Medical Physiology*, Tenth Edition, W.B. Saunders Company, London.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : To identify all the organelles of an animal cell and their functions.
- CO2** : To understand the structure and functions of the various types of systems in the human body.
- CO3** : To demonstrate their knowledge of the importance of anatomical features and physiology of human systems.
- CO4** : To understand and postulate physiological concepts based on anatomical information.
- CO5** : To interpret physiological abnormality and malfunctioning and its impact on health and environment.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	M	M	M	M	H	H	H	H	H	H	L	L
CO2	H	M	H	M	M	H	H	H	M	H	H	L	L
CO3	H	H	H	M	M	H	H	H	M	H	H	L	M
CO4	H	H	H	H	M	H	H	H	L	H	H	L	L
CO5	H	H	H	H	M	H	H	H	H	H	H	L	M

Fundamentals of Biomedical Instrumentation

Semester I
24VMTC02

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To provide adequate knowledge in instruments and measuring techniques.

Unit I Basic Concept of Medical Instrumentation

6

Terminology of medicine and medical devices, Classifications of biomedical instruments, Measurement - Methods and types, General measuring system, performance characteristics, Signals & Noises, Units, Standards Errors and Calibration, Amplifiers & Signal processing.

Unit II Bio potential electrodes

6

Origin of bio potential and its propagation, Electrode-electrolyte interface, electrode– skin interface, Half-cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes, Origin of Bio potential Electrodes - Types of electrodes, ECG, EEG, EMG, ERG - Lead systems and recording methods.

Unit III Sensors and Transducers

6

Strain Gauge - Gauge Factor, Sensing element and types, Temperature Sensors - RTD, Thermocouple, Photoelectric sensors, Photovoltaic cell, Photoconductive cell, Photodiodes and Phototransistors, Piezoelectric sensors, Thermistor, Transducers-Basic requirements, Classification, Principle and types.

Unit IV Measuring Circuits and Electrochemical Measurements

6

Bridges - DC Bridges, AC Bridges, Sources & Detectors, Ammeter, Voltmeter, Wattmeter, Energy meter, Potentiometer, Multimeter, Applications in Biomedical Instruments, Ion Exchange membrane, Chemical electrodes - Ion Selective electrode, reference electrode, pH, pO₂, pCO₂, Oxygen Sensors.

Unit V Display and Recording Devices

6

Cathode Ray Oscilloscope – Block diagram, CRT- vertical & horizontal deflection system, LCD, TFT technology, Medical Display Systems, Multichannel Displays, Non-fade Display Systems, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder.

Total Hours: 30

Practicals:

1. Calibration of Wheat stone's Bridge
2. Calibration of Maxwell's Inductance and Capacitance Bridge
3. Verify the characteristics of Load cell
4. Verify the characteristics of Strain Gauge
5. Verify the characteristics of LVDT
6. Verify the Characteristics of Temperature sensors - RTD, Thermocouple, Thermistor
7. Verify the characteristics of Piezoelectric transducer
8. Verify the characteristics of Photoelectric transducer

Total Hours: 30

Reference books:

1. *Leslie Cromwell (2007) "Biomedical Instrumentation and measurement"*, Prentice hall of India, New Delhi.
2. *khandpur R.S (2014) "Handbook of Biomedical Instrumentation"* Tata McGraw-Hill, New Delhi.
3. *Sawhney.A.K. (2005), Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Demonstrate the basic principle and characteristics of sensors, transducers, measuring instruments and display devices.
- CO2** : Acquire the knowledge of origin of Bio-signals and its recording set up.
- CO3** : Describe the purpose and methods of measurements using instruments.
- CO4** : Test the signals using analog and digital instruments.
- CO5** : Analyze the characteristics of an instrument in different display and recording devices.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	L	M	H	L	H	H	L	H	H	H	M	M
CO2	H	M	H	H	M	H	M	L	H	H	H	M	H
CO3	H	L	H	M	L	M	H	M	H	M	H	H	H
CO4	H	L	H	H	L	H	H	M	H	H	H	H	H
CO5	H	L	H	H	L	H	H	M	H	H	H	H	H

Basic Electrical and Electronics Engineering

Semester I
24VMTC03

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To provide adequate knowledge on the analysis of electric & electronic circuits.

Unit I DC and AC Circuits

6

Basic electrical quantities, definition and units, Electric field & magnetic field, Ohm's law, Kirchhoff's laws, series and parallel circuits, Single phase circuits, three phase circuits.

Unit II Magnetic Circuits and Transformers

6

Basic concepts of Magnetic circuit, Faraday's laws of electromagnetic induction, Transformer and its construction, principle of operation. Special Electrical Machines – DC Generators, DC Motors, Single phase induction Motor

Unit III Semiconductor devices and its application

6

Overview of diode and transistors, various configurations and characteristics, principle of operation of Zener diode. Half wave, full wave, bridge rectifier circuits, filters, voltage regulator, principles of regulated power supply. Clipping and clamping operations using diodes. LDR, LED, 7 segment Display, LCD, Laser diode, Opto coupler, photo transistor.

Unit IV Analog Electronics

6

Introduction to amplifiers, types - cascaded amplifier, differential amplifier, Darlington pair, push pull amplifier. Oscillator circuits – Sinusoidal, phase shift, LC oscillators, Hartley, Colpitts, principle and applications. High pass and low pass RC circuits, operational amplifier basics and applications.

Unit V Digital Electronics

6

Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops –Registers and Counters – A/D and D/A Conversion

Practicals:

Total Hours: 30

1. Verification of Ohm's law, Kirchhoff's law.
2. Measurement of power using Ammeter, Volt meter, Watt meter
3. Load test on Single Phase Transformer.
4. Diode and Zener diode Characteristics.
5. Half wave Rectifier and Full wave Rectifier
6. Transistor characteristics for common emitter configuration.
7. RC phase shift oscillator

Total Hours: 30

Reference books:

1. Mehta, V.K. (2010), *Principles of Electrical and Electronics*, Eleventh Edition, S. Chand publisher, New Delhi
2. Salivahanan.S (2010), *Electronic devices and circuits*, Tata McGraw Hill publishing Company Ltd.
3. Murugesh Kumar, K., & Jagannathan, V (2007), *Basic Electrical, Electronics, Computer and Communication Engineering*, Second Edition, Vikas Publishing House Pvt. Ltd., Ahmedabad.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Familiarize with the basic electrical quantities and circuit law.
- CO2** : Understand the fundamentals of electrical machines and various electronic devices.
- CO3** : Apply the knowledge of semiconductor devices and logic gates in various applications.
- CO4** : Construct simple electronic circuits using the basic electronic components.
- CO5** : To impart knowledge on fundamental concepts of digital electronics.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	L	H	L	L	M	L	M	L	H	M	M	M
CO2	H	L	L	M	M	M	M	L	L	H	H	M	M
CO3	H	L	M	H	H	H	M	H	H	H	H	L	L
CO4	H	L	H	H	M	H	H	M	H	M	L	L	M
CO5	H	L	H	M	H	H	H	L	M	H	H	H	H

Skill Training in Industry -I

Semester I
24VMTS01

Hours of Instruction/week: 8T+20P
No. of credits: 18

Objective:

To provide adequate knowledge in PCB component assembling with reference to the National Occupational Standards framed by ESSCI

Unit I Electronic Components

24

Basic electronics and component identification- characteristics of the components- Resistors Capacitors, Semiconductor devices, piezoelectric devices, Integrated circuits, color codes and polarity of components.

Unit II Electronic Instruments

24

CRO, Function generator, Power Supply, Multi-meter, IC tester, Transistor Tester and other measuring devices.

Unit III Electrical Engineering Drawing

24

Schematic and wiring diagram for domestic simple wiring, symbols used for different electrical devices and equipment, Types of wiring, Factors of selection of a particular wiring system, importance of switch, fuse. Earthing of the wiring system, types of faults, their causes and remedies. Cables & Connectors.

Unit IV PCB Assembling Tools

24

PCB Assembly Machines and Tools - Electric Drill and Drill Bits, Component cutting and Forming tools, Torque screwdriver, Wire Stripper, Side-Cutting Plier, Allen Wrench set, Vacuum Pickup, Tweezers, Magnifying lamp, Microscope, Soldering Station, Wave Soldering Machine.

Unit V Documentation and Workflow

24

Understanding work requirements, coordinate with co-workers, Repairs and maintenance of tools and machinery, Reporting, Documentation, inventory of raw materials, Repetitive errors and improve work process.

Total Hours: 120

Skill Training in Industry: 300

Reference:

1. ELE/Q7804 Qualifications Pack- *PCB Assembly Operator*, Occupational Standards of Electronic Industry, Electronic Sector Skill Council of India, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Acquire basic knowledge on the working of various electronic components and semiconductor devices.
- CO2** : To understand the concept of measurement techniques and familiarize with the usage of modern tools.
- CO3** : Apply the knowledge of wiring techniques for various applications
- CO4** : Apply advanced techniques, skills and modern tools for assembling and soldering of PCB.
- CO5** : Follow the standards and safety operating procedure and practice the process of workflow & documentation in industry

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	L	H	M	L	M	H	H	M	H	H	L	L
CO2	H	L	H	H	L	M	M	M	L	H	H	M	M
CO3	H	L	H	H	M	M	M	M	L	H	H	M	M
CO4	H	L	H	H	H	H	H	H	H	M	H	H	H
CO5	H	L	H	H	H	M	M	H	M	H	H	H	H

Professional English

Semester II
24VLEN02

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objectives:

- To train learners in basic English fluency
- To develop English language skills.

Course Outcomes:

At the end of the course the students will be able to:

- CO1:** Use English skills with reasonable competence
- CO2:** Know the time management and goal setting in writing
- CO3:** Widen professional work habits with effective collaboration
- CO4:** Make wider public speaking skills
- CO5:** Develop creative and innovative skills through letters, posters, and invitation designs.

Unit I Language through reading

6

Basic understanding of passage, reading newspapers and comprehending Simple reports.

Unit II Focus on Language

6

Prefixes and Suffixes, Synonyms and Antonyms, Tenses, use of prepositions, Subject-verb agreement, Editing, British and American English.

Unit III Language through Practice

6

Resume writing, writing instructions and recommendations, preparing checklists, Formal letters, writing to officials (leave letter, seeking permission for practical training, asking for certificates, testimonials), Creative writing, Goal setting, Time management.

Unit IV Oral practice

6

Public speaking skills: Compering - Introducing a guest to the audience, welcome address, proposing a vote of thanks. Conducting conversations - listening and responding, answering according to situations.

Unit V Creative skills

6

Designing posters, Slogan/caption writing, creating one's own posters, Designing advertisements.

Total Hours: 30

Practicals:

1. Reading & listening Skills- Book review/ Article reading, Listening Comprehensive exercise.
2. Oral communication through video lessons, Group Discussion, Mock Interview.
3. Language and vocabulary learning using online grammar exercises, word building etc.,
4. Creative skills - Preparation of advertisement individually on specific products/services.
5. Writing skills - Writing reports on internship experience/ reports on Incident etc.,

Total Hours: 30

Reference Books:

1. **Aysha Viswamohan (2008)**, *English for Technical Communication*, Tata McGraw Hill Publishing Co Ltd, New Delhi.
2. **Dr. S. Sumant. (2005)**, *English for Engineers*. Tata McGraw Hill Publishing Co Ltd, New Delhi.
3. **M. Ashref Rizvi. (2005)**, *Effective Technical Communication*. Tata McGraw Hill Publishing Co Ltd, New Delhi.

Computer Fundamentals

Semester II
24VMTC04

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To impart fundamental knowledge about Computer and networking

Unit I Computer fundamentals

6

Introduction - Hardware, Software, System Software, Application Software. Types and Block Diagram of a Computer. Storage – Primary & secondary Memory, I/O Devices

UNIT II Software Concepts

6

Number System and its types, Introduction to Programming, Flowcharts and Algorithms. Types of Software, Application software's, Firmware software's, Computer Languages like machine, Assembly, and Higher-Level Languages.

Unit III Operating Systems and Office automation software

6

Operating System – MS-DOS/WINDOWS/LINUX/UNIX. Programming Languages, Features and trends. Introduction to Office Automation Tools: MS-Office, Word, PowerPoint, Excel, Access, Working with PC PACKAGES.

Unit IV Internet

6

Basic concepts and applications of Internet, Basics of internet connectivity related troubleshooting. ISP, World Wide Web - brief history. Using search engine and beginning Google search – Explorer and Navigator, Understanding URL; Domain name-IP Address, Uploading and Downloading of files and images, E-mail ID creation - Sending messages, Attaching files. HTML.

Unit V Networking and Communication

6

Basic elements in networking, Types - Network Topologies, Models, Security of data. Data communication, Its components, optical communication - Fiber optics and types, Fabrication process, Principles of light propagation through a fiber and Losses.

Total Hours: 30

Practicals:

1. Conversion of number system. Additions, Subtractions, Multiplications, Divisions
2. Office automation software. MS-Word, MS-Excel, MS-PowerPoint
3. To create an email and to learn uploading/downloading of files
4. Creation of web pages using HTML tags
5. Configuring the PCs in LAN by TCP/IP setting

Total Hours: 30

Reference books:

1. **Rajaraman. V (2006), *Fundamentals of Computers*, PHI, New Delhi.**
2. **William Stallings (2007), *Data and Computer Communications*, Pearson Education, New Delhi.**
3. **Silberschatz, Galvin, Gagne (2003), *Operating System Concept*, John Wiley and Sons, New Delhi.**

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the concept of computers and recognize the basic terminology used in computer programming
- CO2** : Familiarize operating systems, programming languages, peripheral devices, networking multimedia and internet
- CO3** : Apply different office tools to create, manipulate and retrieve data
- CO4** : Apply file management techniques for file and directory/folder organization
- CO5** : Analyze the security of data through network and communication.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	L	H	L	L	M	L	M	L	H	M	L	L
CO2	H	L	L	M	M	M	M	L	L	H	H	L	L
CO3	H	L	M	H	H	H	M	H	H	H	H	L	L
CO4	H	L	H	H	M	H	H	M	H	M	L	L	L
CO5	H	L	H	H	M	M	H	H	H	M	M	M	M

Concept of Health and Medical Terminology

Semester II
24VMTC05

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To gain basic knowledge on disease and demonstrate their understanding of health principles.

Unit I Concept of Health and Diseases

6

Concept of health - Definition - Dimensions of health - Spectrum of health - Determinants of health - Indicators of health, Concept of disease - Concepts of disease causation - Natural history of disease - Concept of disease control – Concept of prevention - Disease classification.

Unit II Introduction to Health Law and Code of Ethics

6

Introduction to Health Law – Basic Concepts of Law, Courts and Legal System – Duties and Responsibilities of a Doctor – Hippocratic Oath - Geneva Declaration - Declaration of Helsinki, Medical Code of Ethics – Medical Negligence – Qualities of a Great Medical Professional – Patient’s rights and responsibilities.

Unit III Epidemiology and Handling of Emergency Situation

6

Definition and basic concepts of Epidemiology - Basic measurement - Health Indicators - Methods of epidemiology - Infectious disease epidemiology - Investigation of an epidemic outbreak, Basic Life Support - Fire Fighting - Occupational Hazards - Trauma Care - Knowledge of Codes and Standards - Emergency Situation - Paging - First aid - Corrective and Preventive Process.

Unit IV Infection Control

6

Introduction to HAI and its types - Infection control measures - Host defense - Immune response - Immunization agents, Hazards of Immunization - Disease Prevention and Control - Nosocomial infection - Chain of infection - Asepsis, Reservoir, Carrier - Mode of transmission of communicable diseases - Non-communicable Disease - Barrier nursing - Isolation - Hand Hygiene - PPE kit - Spill Kit.

Unit V Hospital Safety Standards

6

Healthcare organization management standards - General requirements for basic safety and essential performance of medical equipment - IEC Standards - EMC radiation protection - Life Safety Standards - Protecting Occupants - Protecting the Hospital and Individuals from Fire, Smoke and Heat - Providing and Maintaining Fire alarm system - System for Extinguishing fire environment - Managing Hazardous materials.

Total Hours: 30

Practicals:

1. BLS
2. First-aid
3. Emergency
4. Hazard Management

Total Hours: 30

Reference books:

1. **K. Park (2007)**, *“Preventive and Social Medicine”* M/S BanarsidasBhanot Publishers, 19th Edition.
2. **Dr. B. Srishar Rao (2015)** *“Principles of Community Medicine”* AITBS Publishers, 6th Edition, New Delhi.
3. **S. L. Goel (2004)**, *“Healthcare Organization and Structure”* Deep and Deep Publications Pvt Ltd., New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand about the concept of health, disease, compare different types of disease causation and demonstrate the knowledge on concepts of disease prevention.
- CO2** : Understand the concept of law in healthcare and explain its relevant information to all its stakeholders.
- CO3** : Understand and analyze various epidemiological principles and strategic models in conducting field studies.
- CO4** : Illustrate the concept of infection, prevention, and control.
- CO5** : To create awareness on hospital safety and standards followed by healthcare.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	L	H	M	M	M	L	L	L	L	M	L	L	L
CO2	L	H	M	M	M	M	L	L	L	M	L	L	L
CO3	L	H	M	M	M	L	H	M	L	L	L	L	L
CO4	L	H	M	M	M	L	M	L	L	L	L	L	L
CO5	L	H	M	M	H	L	M	L	L	L	L	H	H

Microprocessor and its Applications

Semester II
24VMTC06

Hours of Instruction/week: 2T+2P
No. of credits: 3

Objective:

To impart knowledge on microprocessor, microcontroller and its applications

UNIT I Introduction 6

Overview of Microprocessors, Intel 8085 architecture and its operations, pin and signals, timing diagram, memory, input/output, logic devices for interfacing.

UNIT II Programming 8085 6

Addressing modes, Instruction classification, Instruction and Data formats, 8085 Instruction set, counters and time delays, stack and subroutine, simple programs.

UNIT III Peripheral Devices and Interfacing 6

Interface requirements, Memory interfacing, interfacing input devices, output displays, memory mapped I/O, 8255 PPI- 8085 interrupts, vectored Interrupts, restart as software instructions, DMA data transfer scheme, 8237 DMA controller.

UNIT IV 8086 Microprocessor 6

Architecture of 8086, Minimum mode, Maximum mode and timings, Instruction set, Addressing modes, Assembler directives, Interrupts, programs.

Unit V Introduction to Microcontroller and Embedded system 6

Block diagram of 8051, registers in 8051, data memory, internal and external memory, addressing modes, instruction set-subroutines, the counter/timer and various modes of operation in the timer. Embedded system - History and need of embedded system, Basic components, PIC Architecture.

Total Hours: 30

Practicals:

1. ALP to perform addition and subtraction of two 8-bit numbers
2. ALP to perform multiplication and division of two numbers
3. Finding the smallest and largest number in an array of 8-bit numbers
4. Ascending and descending order of given N 8-bit numbers
5. Interfacing 8085 and traffic light control system
6. ALP to perform arithmetic operations in 8051 microcontrollers
7. Stepper motor using 8051 microcontrollers

Total Hours: 30

Reference books:

1. Gaonkar.R.S. (2005), "*Microprocessor Architecture Programming and Application*", Penram, International Publishers.
2. Janice GilliMazidi and Muhammad Ali Mazidi (2007), "*The 8051 Microcontroller and Embedded Systems*" Pearson Education Publishing Ltd.
3. John Uffenbeck (2011), "*The 8086 family Design, Programming and Interfacing*", Third Edition, Pearson Education.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the architecture, memory organization of microprocessor 8085, 8086 and microcontroller 8051.
- CO2** : Describe the addressing modes, instruction set of microprocessors and microcontroller.
- CO3** : To understand the basic idea on data transfer scheme and its applications.
- CO4** : Interface different external peripheral devices with microprocessors and microcontrollers.
- CO5** : To understand and analyze the basic building blocks of embedded systems.

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	L	M	H	H	M	H	M	L	H	M	L	L
CO2	H	L	H	H	M	H	M	L	L	M	H	L	L
CO3	H	L	H	H	H	H	H	H	H	H	H	L	L
CO4	H	L	H	H	M	H	H	M	H	M	M	L	L
CO5	H	L	M	H	M	M	H	M	M	H	M	M	M

Skill Training in Industry-II

Semester II
24VMTS02

Hours of Instruction/week: 8T+20P
No. of credits: 18

Objective:

To provide adequate knowledge in PCB component assembling with reference to the National Occupational Standards framed by ESSCI.

UNIT I PCB Board 24

Types of PCB - single sided, double sided, multilayered, rigid, flexible. PCB Material, Board Layers, Colors and Grids. Defining PWR/GND layers.

UNIT II PCB Components Assembly 24

Electronic components & SMD Components, Collecting components. Labelling & placing components, Testing & packing.

UNIT III Soldering 24

Basics of soldering materials- soldering wire, flux, Desoldering pump, Components mounting, Soldering techniques- Hand soldering, wave soldering, SMT equipment, Cleaning and testing.

Unit IV Safety Operating Procedure 24

Potential sources of accidents- hazardous chemicals, gases, sharp tools, Electrostatic discharge (ESD) precautions, Policies for handling hazardous materials, Protective measures, First aid execution.

Unit V Documentation and Workflow 24

Understanding work requirements, coordinate with co-workers, Reporting, Documentation, Inventory of raw materials, Rework instructions, Repetitive errors and improve work process.

Total Hours: 120

Skill Training in Industry: 300

Reference

1. ELE/Q7804 Qualifications Pack- *PCB Assembly Operator*, Occupational Standards of Electronic Industry, Electronic Sector Skill Council of India, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Analyze the working of various electronic components, PCB layers and its terminologies.
- CO2** : Apply the knowledge of soldering techniques for various applications
- CO3** : Describe the characteristics of electronic components and familiarize with the usage of modern tools
- CO4** : To differentiate the electronic components with soldering techniques.
- CO5** : Follow the standards and safety operating procedure and practice the process of workflow & documentation in industry

CO, PO MAPPING

COs / POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	H	M	H	M	H	M	L	M	H	M	H	L	L
CO2	H	M	M	H	M	M	M	M	L	L	H	L	L
CO3	L	M	H	H	H	H	M	H	H	M	H	L	L
CO4	H	M	H	H	H	M	M	M	M	L	H	M	M
CO5	H	H	M	H	H	H	H	H	H	L	H	H	H

Diagnostic and Therapeutic Equipment

Semester III
24VMTC07

Hours of Instruction/week: 3T+2P
No. of credits: 4

- Unit 1 Equipment for physiological signals acquisition** **6**
Bioelectric signals and their characteristics - Electrodes for ECG, EEG and EMG - ECG Machine – EMG machine - EEG machine - PCG - Audiometer.
- Unit 2: Vital monitoring system** **6**
Measurement of human body temperature -Blood pressure monitor - ABG analyzer - Plethysmograph - Fetal monitoring and its types -Pulse Oximeter - Spirometer.
- Unit 3: Clinical and Optical Equipment** **6**
Clinical equipment - Centrifuge - Blood Cell Counter - Glucometer -Hemoglobin monitor - Endoscopy and its types, Optical Method - Colorimeter - Spectrophotometer - Flame photometer – Chromatography - Mass Spectrometer - Clinical microscope and its types.
- Unit 4: Drug Delivery devices and Therapeutic LASERS** **6**
Conventional methods -Infusion pumps - Syringe pumps - Basic principles of Biomedical LASERS: Applications of lasers in medicine - CO2 laser, He-Ne laser, Nd-YAG and Ruby laser.
- Unit 5: Therapeutic equipment** **6**
Nebulizers - Flow meters - Bubble CPAP – principle of operation and functions - Lithotripsy & its types - Cryosurgery.

Total Hours: 45

Practicals

1. To demonstrate the working of ECG
2. To demonstrate the working of Audiometer
3. To demonstrate the working of Sphygmomanometer
4. To demonstrate the working of Spirometer
5. To demonstrate the working of Endoscopy
6. To demonstrate the working of Infusion Pump
7. To demonstrate the working of Syringe pump
8. To demonstrate the working of Nebulizer

Total Hours: 30

Reference books:

- 1.Khandpur, R.S. (2003), *Handbook of Biomedical Instrumentation*, Second Edition, Tata McGraw Hill Pub. Co, Ltd
- 2.Bronzino. J.D. (2000), *The Biomedical Engineering handbook*. Second Edition.Vol. II, CRC press, Boca Raton.
- 3.Arumugam .M (1992), “**Biomedical Instrumentation**”, Anuradha Publishers.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Identify The procedure for acquisition of Bio signals.
- CO2** : To study various display techniques and use of ultrasonic.
- CO3** : Demonstrate the methods for various vital parameters.
- CO4** : Describe the principle involved in clinical and Optical Equipment.
- CO5** : Describe the Functions of Various Non-Invasive Equipment.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	M	M	M	H	M	H	H	H	H	H	L	L
CO2	H	M	H	M	L	L	H	H	H	H	H	M	M
CO3	H	M	M	M	L	L	M	H	H	H	H	L	L
CO4	H	M	H	M	M	M	H	H	M	H	H	L	L
CO5	H	H	H	M	H	M	H	H	H	H	H	L	L

Electrotherapy and Physiotherapy Equipment

Semester III
24VMTC08

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objectives:

1. The student will learn the principles, technique and effects of electrotherapy and physiotherapy as a therapeutic modality in the restoration of physical function.
2. To enable the students to understand their role in the management of disability within the rehabilitation

UNIT I Electricity and Basics of Electrical Stimulation 9

Basic Physics, Importance of Currents in Therapy, Electro- magnetic spectrum, Resting membrane potential, Action Potential, Propagation of Action potential, Motor Units, Physiological effects & Therapeutic effects of Faradic Current.

UNIT II Electrotherapy using Low, Medium & High Frequency Currents 9

TENS, Principle of working of Short-wave diathermy, Microwave Diathermy, Treatment parameters, Ultrasound Therapy

UNIT III Orthotic devices 9

Principles involved in prescribing orthotic devices for different parts of the body, demonstrate methods of training in their use. Purpose of each type and list major indications, contraindication.

UNIT IV Prosthetic Devices and Mobility Aids 9

Types of artificial limbs and their functions, methods of training in their use. Various types of mobility aids and their functions, Wheelchair, walker, crutch, cane.

Unit V Community based Rehabilitation 9

CBR module, Phases of cardiac rehabilitation, Steps in pulmonary rehabilitation, Physiotherapy in general surgery, Physiotherapy for peripheral vascular diseases.

Total Hours: 45

Practicals

1. To demonstrate the working of TENS
2. Study of Short-wave diathermy
3. Study of Microwave diathermy
4. To demonstrate the working of Ultrasound therapy
5. Study of Wax bath

Total Hours: 30

Reference books:

1. **John Low & Ann Reed. (2000), *Electrotherapy Explained, Principles and Practice*. Second Edition. Butter worth Heinemann Ltd.**
2. **Bronzino J.D. (2000), *The Biomedical Engineering handbook*. Second Edition. Vol. II, CRC press, Boca Raton.**
3. **Rory Cooper Douglas, A. Hobson. (2007), *An Introduction to Rehabilitation Engineering*, CRC Press.**

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : To understand the fundamentals of electricity in therapy, electro-magnetic spectrum and ultrasound.
- CO2** : Able to demonstrate the techniques of applications of various electrotherapy modalities.
- CO3** : Illustrate the purpose of orthotic devices and analyze its contraindications.
- CO4** : Identify, describe, and compare the basic components and control of the prosthesis.
- CO5** : Familiarize with community-based rehabilitation.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	H	H	M	M	H	L	M	H	M	H	L	L
CO2	H	M	H	H	H	M	H	M	L	L	H	M	M
CO3	H	M	H	H	H	H	H	H	H	H	H	H	H
CO4	H	M	H	H	H	H	H	M	H	H	H	M	M
CO5	H	H	H	H	H	H	M	M	H	M	H	H	H

ICU and Operation Theatre Equipment

Semester III
24VMTC09

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objective:

To impart the knowledge of equipment used in ICU and operation theatre

UNIT I ICU Equipment 9

Introduction to ICU, Defibrillator – types and modes, Holter monitoring unit, Laryngoscope, Ophthalmoscope, Otoscope, Suction apparatus – Mobile and centralized supply, Patient Warming system.

UNIT II Critical Care & NICU Equipment 9

Monitors for various vital parameters, Baby incubators, Radiant heat warmers and Phototherapy – principle of operation, Types.

UNIT III Operation Theatre Equipment 9

OT and Surgical instruments, Operation theatre table & Lighting, Ceiling pendants, Anaesthesia Equipment, Boyle's apparatus, Surgical diathermy - modes and safety aspects.

UNIT IV Centralized Systems 9

Centralized Oxygen, Nitrogen, Air supply & Suction. Centralized Air Conditioning, RO systems

Unit V Sterilization 9

Autoclave - Types - Operating procedure - Maintenance - Sterilization - Classification - CSSD - Fumigator.

Total Hours: 45

Practicals:

1. Study of Defibrillator
2. To demonstrate the working of Suction apparatus
3. Recording of vital parameters using Multiparameter monitor
4. To demonstrate the working of Baby Incubator
5. Radiant heat warmer and phototherapy
6. To demonstrate the working of Surgical Diathermy
7. To demonstrate the working of Autoclave

Total Hours: 30

Reference books:

1. Khandpur, R.S. (2003), *Handbook of Biomedical Instrumentation*, Second Edition, Tata McGraw Hill Pub. Co, Ltd
2. John, G. Webster (2007), *Medical Instrumentation, Application and Design*, Second Edition John Wiley & sons, Inc., New York.
3. Joseph Dubovy (1978), *Introduction to Biomedical*. McGraw Hill Co.
4. Terry Bahil, A (1981), *Biomedical and Clinical Engineering*, Prentice Hall Inc.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the principle and working of equipment used in ICU equipment.
- CO2** : Classify the Intensive care devices and its applications.
- CO3** : Classify the OT equipment and its applications.
- CO4** : Understand the different types of Centralized systems.
- CO5** : Practice sterilization standards.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	L	M	H	H	M	M	H	L	L	H	M	M
CO2	H	L	M	H	H	L	H	M	L	L	M	M	M
CO3	H	L	M	H	M	H	L	M	L	L	M	L	L
CO4	H	M	M	L	M	L	L	M	L	L	H	L	L
CO5	H	H	M	M	H	L	M	M	L	L	M	H	H

Hospital Standards and Policies

Semester III
24VMTS03

Hours of Instruction/week: 4T+10P
No. of credits: 9

Objective:

1. To impart knowledge on the international codification system and the implementation procedures in the healthcare system.
2. To create awareness on the role of hospital records in health care delivery in hospitals.

Unit I Hospital Policies and Standards

12

Introduction - Functions - Importance - Documentation of Policies and Standards, Rights and Responsibilities - Patient - Doctors - Healthcare Workers, Managing hospital policies & standards - Introduction to SOP.

Unit II Medical Records

12

Medical

Records - Legal Aspects of Medical Records - Retention and Disposal of Medical records, Documentation - EMR.

Unit III Biomedical Waste Management

12

Introduction - Categories of biomedical wastes – Disposal of biomedical waste products – Incineration and its importance, Indian Medical Association – TNPCB Rules and Schedules – Standards for Waste autoclaving, microwaving and deep burial – Segregation – Packaging – Transportation – Storage.

Unit IV Patient Safety

12

Physiological effects of electricity - basic approaches to protection against shock - Leakage current - Inspection of grounding and patient isolation - Basic Life Support - CPR - Fire safety - PPE - Radiation safety - Electrical safety - Hospital Hazards & types, Safety codes and standards - First aid.

Unit V Licenses and Certifications

12

Land - Fire - Pollution - Blood Bank - Transplantation of Human Organs - Environment protection - Indian medical council - Ambulance - Pharmacy - FSSAI - Sewage - Electricity - Medical gas - Birth and Death - Medical devices.

Total Hours: 60
Skill Training: 150

Reference books:

1. **Goel S. L. (2010), “Healthcare Organization and Structure”** Deep and Deep Publications Pvt Ltd., New Delhi
2. **Mogli G. D. (2001) “Medical Records - Organization and Management”** Jaypee Brothers, New Delhi.
3. **G. D. Kunders (2004), “Hospitals - Facilities Planning and Management”** Tata McGraw-Hill Publishers Pvt Ltd., New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Describe the concept of Hospital Policies and Procedures.
- CO2** : Understand the history of Medical records, Policies, and legal aspects of the Medical record Department.
- CO3** : Understand the concept of Biomedical waste system management.
- CO4** : Illustrate the steps involved in safety.
- CO5** : To gain fundamental knowledge about the hospital certifications and Licenses.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	L	H	H	H	H	H	M	L	L	M	L	H	H
CO2	L	H	M	H	H	L	M	L	L	M	L	H	H
CO3	L	M	M	M	H	L	M	L	L	M	L	H	H
CO4	L	H	H	M	H	H	M	L	L	M	L	H	H
CO5	L	H	L	M	H	M	M	L	L	M	L	H	H

Skill Training in Hospital - I

Semester III
24VMTS04

Hours of Instruction/week: 4T+10P
No. of credits: 9

Objective:

To impart adequate knowledge in the handling of patients with reference to the National Occupational Standards framed by HSSC.

1. HSS/N6104: Assess patient requirement and act accordingly
2. HSS/N6105: Prepare for patient admission, registration & direct patient to accurate unit as per medical advice
3. HSS/N6106: Liaise & coordinate with healthcare team for effective patient management
4. HSS/N6107: Assist & coordinate during discharge & referral services & TPA services
5. HSS/N6108: Facilitate billing & process cash/credit transactions
6. HSS/N9615: Maintain interpersonal relationship with patients, colleagues and others
7. HSS/N9616: Maintain professional & medico-legal conduct
8. HSS/N9617: Maintain a safe, healthy and secure working environment
9. HSS/N9618: Follow infection control policies & procedures including biomedical waste disposal protocols

Total Hours: 60

Skill Training: 150

References:

1. HSS/Q6104 Qualifications Pack - *Patient Relations Associate*, Occupational Standards of Healthcare Sector Skill Council, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Enhance their skill and capacities in counsel and assist visitors/patients who visits Healthcare Organization and provide with solutions
- CO2** : Enhance skills for coordinating activities at hospital front desk, registration services & coordination with healthcare team.
- CO3** : Perform certain administrative task such as maintenance of records, paperwork, billing, coordination during patient referrals, administrative & basic management
- CO4** : Facilitate customer service excellence and patient satisfaction
- CO5** : Demonstrate Basic Life Support, Cardio Pulmonary Resuscitation and other actions in the event of medical and facility emergencies

CO, PO MAPPING

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	L	H	H	H	H	M	L	M	L	M	H	H	H
CO2	L	H	H	H	H	L	L	M	L	H	H	H	H
CO3	L	M	M	M	H	L	L	L	L	M	H	H	H
CO4	L	H	H	H	H	L	L	L	L	M	H	H	H
CO5	M	H	H	H	H	M	M	L	L	M	M	H	H

Hospital Information System

Semester IV
24VMTC10

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objective:

1. To understand and appreciate the role and value of information technology in potentially revolutionizing healthcare.
2. To analyze obstacles and success factors for implementation and integration of information, communication and decision technologies in healthcare.

Unit I Information System

9

Introduction - Importance of information system - Impact on Healthcare - Future of healthcare technology, World of informatics - Importance - Rights - Structure, Health informatics - Components - Goals - Classification - Future.

Unit II Changing Information System

9

Changing information System - Impact for Automation - Organizational Culture - Resistance to Change - Importance of Managing change, Management Strategies, Information becomes Knowledge through Research: Types – Data Management – Ethical Issues

Unit III Role of Information

9

Right information – process of decision making – Literature Database – Problems in Literature seeking – Standards of Information seeking, Securing the information: Privacy and confidentiality – Computer Crimes – Security – Law, Role of HealthCare Professionals in protecting the Information.

Unit IV Electronic Health Record

9

Functions - Implementation – Advantages – Disadvantages, Telehealth - Types – Initiatives – Advantages – Barriers – Future, Future of Informatics - Globalization of Information in Public Health - Education - Knowledge - Security, Wireless computing – Barriers

Unit V Administrative Applications of Computer

9

Medical Informatics - Administrative Application of Computer technology – Medical Office Administrative Software - Information Technology in Radiology – Information Technology in Pharmacy – Computerized Pharmacy – Tele pharmacy.

Total Hours: 45

Practicals:

1. HIS
2. RIS
3. PACS
4. EMR

Total Hours: 30

Reference books:

1. **Kathleen M. Young (2000)**, *“Informatics for Healthcare Professionals”* F. A. Davis Company.
2. **Lilian Burke, Barbana Weill (2005)** *“Information Technology for the Health Professionals”* 2nd Edition, Pearson Prentice Hall.
3. **Dee Megonagle and Kathleen Mastrian (2010)**, *“Nursing Informatics and Foundation of Knowledge”* 2nd Edition, Jones and Bartlett India Pvt Ltd.,

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand and analyze various concepts and prerequisites of health informatics.
- CO2** : Understand and categorize different data's and identify different healthcare organizational cultures.
- CO3** : Understand, analyze and compare privacy and confidentiality laws involved in maintaining quality health systems.
- CO4** : Learn, apply and criticize the concept of EMR and telemedicine in healthcare.
- CO5** : Asses and compare administrative application skills of computer technology in healthcare.

CO, PO MAPPING

COs/ POs	PO 1	PO2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2
CO1	L	H	H	H	H	H	H	L	L	H	L	M	M
CO2	L	H	H	M	H	H	M	L	L	M	L	M	H
CO3	L	H	H	H	H	H	M	L	L	M	L	M	H
CO4	L	M	M	H	H	H	H	L	L	M	L	L	L
CO5	L	M	H	M	H	H	L	L	L	M	L	L	L

Life Support Device

Semester IV
24VMTC11

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objectives:

1. To impart adequate knowledge on the importance of various Life support device.
2. To gain knowledge in maintenance and troubleshooting methods.

UNIT I Life support device in Intensive Care Units 9

Arrhythmia and Ambulatory monitoring devices, Pacemakers – types, internal and external pacing, batteries, implantable type.

UNIT II Cardiac assist device -I 9

Heart Lung machine, different types of oxygenators, peristaltic pumps, Regulation of temperature – Homotherm.

UNIT III Cardiac assist device – II 9

Intra-Aortic Balloon Pump – Importance and principle of operation, Helium gas cylinders, Types of balloons and stents.

UNIT IV Respiratory assist device 9

Ventilator – Mechanics of respiration, Artificial ventilation, Types and classification of ventilators, High frequency ventilators, Humidifiers and Aspirators.

Unit V Renal assist device 9

Peritoneal dialysis, Hemodialysis machines – dialyzers, membranes for hemodialysis, proportioning pump, blood pumps, heparin pump, blood leak detectors, Portable kidney machines.

Total Hours: 45

Practicals

1. To study the working of Pacemaker
2. To demonstrate the working of Heart lung machine
3. To study the working of IABP
4. To demonstrate the different modes of operation in Medical Ventilator
5. To study the working of Hemodialysis machine

Total Hours: 30

Reference books:

1. **R.S. Khandpur (2003)**, “*Handbook of Biomedical Instrumentation*”, Second Edition, Tata Mc Graw Hill.
2. **John G. Webster (2004)** “*Medical Instrumentation*”, Third Edition John Wiley & Sons.
3. **Cromwell (2009)**, “*Biomedical Instrumentation & Measurements*” Second Edition, Prentice-hall of India private limited.
4. **Carr& Brown (2004)**, “*Introduction to Biomedical Equipment Technology*”, Seventh Edition, Pearson Education.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the fundamentals of Intensive care equipment.
- CO2** : Acquire the knowledge of the importance of Cardiac assist devices.
- CO3** : Explain the importance of IABP.
- CO4** : Describe the functions of respiratory devices.
- CO5** : Analyze the operations of Extra corporeal circulating devices.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2
CO1	H	M	H	M	H	H	M	H	L	M	H	L	L
CO2	H	M	H	H	H	H	H	H	M	M	H	L	L
CO3	H	M	H	H	H	M	H	H	M	M	H	L	L
CO4	H	M	H	H	H	M	H	H	M	M	H	L	L
CO5	H	L	H	H	H	M	H	H	M	L	M	L	L

Radiology and Medical Imaging

Semester IV
24VMTC12

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objectives:

1. To understand the fundamentals of radiology equipment.
2. To impart knowledge in nuclear medicine imaging systems

UNIT I Introduction to Radiation 9

Electromagnetic spectrum, Radioactive elements, Radioactive decay, decay energy and half-life, Interaction of radiation with matter, attenuation, Radiation units and quantities- Roentgen, Rad, rem, sievert.

UNIT II Radiation Imaging Techniques 9

Production of X-rays, X-ray machine, filament circuits and mA control, KV control, beam restrictors and grids, collimators, Fluoroscopy, Angiography, Image intensifier, Digital Radiography, CT scanner, X-Ray film processor.

UNIT III Medical Imaging Techniques 9

Introduction to ultrasound scanners - Block diagram, principle and working, Transducers used, A-Scan, B-scan and M-mode, Doppler, Echo. Fundamentals of Magnetic Resonance- Block diagram of MRI system, Artifacts. Principle of thermal imaging and applications.

UNIT IV Nuclear Imaging Techniques 9

Basic atomic and Nuclear physics, Quantities and units, Radiation detectors, Gas filled detectors, Ionization chambers, Geiger Muller counters, Scintillation detectors, Radio -isotopes, Recti-linear scanner, Gamma Camera, Principles of PET, SPECT.

Unit V Radiation Therapy and Radiation safety 9

Radiation therapy – Brachytherapy and Teletherapy, Linear accelerator, Radiation safety in Nuclear medicine, MPD, Safe handling of Radioactive materials, Dosimeter, film Badges, Thermoluminescent dosimeters.

Total Hours: 45

Practicals:

1. X-Ray machine
2. Film processor
3. Ultrasound scanner
4. Dosimeters and Film Badges
5. LINAC

Total Hours: 30

Reference books:

1. **Dendy P. P& Heaton, (2000), *Physics for Radiologists*, Third Edition, Charles C.Thomas Publisher S.A**
2. **Gopal B. Saha. (2006), *Physics and Radiobiology of Nuclear Medicine*, Third Edition, Springer Publisher.**
3. **Khandpur R.S. (2003), *Handbook of Biomedical Instrumentation*, Second Edition, Tata McGraw Hill.**

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Classify the source and characterize the types of radiation.
- CO2** : Describe about the radiation imaging techniques and its applications.
- CO3** : Describe the different types of medical imaging techniques.
- CO4** : Explain the principles of nuclear imaging and applications of radioisotopes for diagnosis and therapy.
- CO5** : Identify the need for radiation therapy, radiation safety and monitoring for protection from Hazards.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2
CO1	H	L	H	L	L	M	H	M	H	M	H	L	L
CO2	H	L	H	L	L	M	H	H	H	M	H	L	L
CO3	H	L	M	L	L	M	H	H	H	M	H	L	L
CO4	H	L	H	M	L	M	H	H	H	M	H	L	L
CO5	H	L	H	H	M	L	M	M	H	M	M	H	H

Quality in Healthcare

Semester IV
24VMTS05

Hours of Instruction/week: 4T+10P
No. of credits: 9

Objective:

To gain fundamental knowledge of Quality management techniques in hospitals.

Unit I Aspects of Quality

12

Concept of Quality in Healthcare - Definition - Evolution - Quality Gurus - Cost of Quality - Quality obstacles and benefits - Ethics in Quality - Voice of the Customer - Translating needs into requirements - Strategic Planning.

Unit II Benchmarking

12

Benchmarking – Introduction – Process of Benchmarking – Benefits – Pitfalls – Success Indicators - Gap Analysis process - Benchmarking template - Initiating the process of Benchmarking - Planning and Implementation - Application.

Unit III Statistical Process Control

12

History - Seven tools of Quality - Control Charts - Check Sheets - Histogram - Scatter Diagram - Process Flow diagram - Cause and Effect Diagram - Pareto Chart - PDCA Cycle.

Unit IV Quality Function Deployment and Quality Systems

12

Introduction to QFD - Concept, Quality Audits - Six Sigma - JIT - Balance Score Card - FMEA - SWOT - Code of conduct and Documentation Policy.

Unit V Introduction to Certification and Accreditation

12

ISO Certification in Healthcare - Concepts and Elements of ISO - Documentation of ISO Standards, QCI - Hospital Accreditation and Standards - NABL - NABH - JCI - Standards - Procedure - Requirements - Documentation.

Total Hours: 60
Skill Training: 150

Reference books:

1. **S. K. Joshi (2009), “Quality Management in Hospitals”** Jaypee Brothers Medical Publishers Pvt Ltd.,
2. **Bester Field H. Dale (2005) “Total Quality Management”** Pearson.
3. **G. D. Kunders (2008), “Hospitals - Facilities Planning and Management”** Tata McGraw-Hill Publishers Pvt Ltd., New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the concept and origin of Quality in Healthcare.
- CO2** : Analyze various Benchmarking processes and its implementation.
- CO3** : Analyze the Statistical process control methods to evaluate quality processes.
- CO4** : Evaluate the Quality Functional Deployment and its benefits.
- CO5** : Create and evaluate the various Certification, Accreditation processes and understand documentation on Quality manuals.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO11	PSO1	PSO2
CO1	L	M	H	H	H	M	M	L	L	H	M	M	M
CO2	L	M	H	M	H	M	M	L	L	H	M	M	M
CO3	L	M	H	H	H	M	M	L	L	H	M	M	M
CO4	L	M	M	H	H	L	M	L	L	H	M	H	H
CO5	L	M	H	H	H	L	M	L	L	H	M	H	H

Skill Training in Hospital - II

Semester IV
24VMTS06

Hours of Instruction/week: 4T+10P
No. of credits: 9

Objective:

To impart adequate knowledge in the handling of patients with reference to the National Occupational Standards framed by HSSC.

1. HSS/ N 6109: Manage Hospital front desk
2. HSS/ N 6110: Coordinate in house operations at healthcare facility
3. HSS/N 6110: Implement and undertake corrective action in view of hospital policy, administration and work rules
4. HSS/ N 9615: Maintain interpersonal relationship with colleagues, patients and others
5. HSS/ N 9616: Maintain professional and medico-legal conduct
6. HSS/ N 9617: Maintain a safe, healthy and secure working environment
7. HSS/ N 9618: Follow biomedical waste disposal and infection control policies and procedures

Total Hours: 60
Skill Training: 150

References:

1. HSS/Q6103 Qualifications Pack - *Assistant Duty Manager -Patient Relation Services*, Occupational Standards of Healthcare Sector Skill Council, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : To explain and comprehend about health disease and wellbeing
- CO2** : Describe about personnel management and identifying appropriate resources
- CO3** : Demonstrate professional behavior, personal qualities and characteristics of a hospital front desk coordinator
- CO4** : Demonstrate Basic Life Support, Cardio Pulmonary Resuscitation and other actions in the event of medical and facility emergencies
- CO5** : Demonstrate correct method of bio-medical waste management

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO11	PSO 1	PSO 2
CO1	L	H	M	L	H	L	L	M	L	H	H	H	H
CO2	L	M	M	M	H	L	L	L	L	H	H	H	H
CO3	L	H	M	H	H	L	L	L	L	H	H	H	H
CO4	L	M	M	L	H	L	M	L	L	H	H	M	M
CO5	L	M	M	M	H	L	M	L	L	H	H	M	M

Telehealth Technology

Semester V
24VMTC13

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objective

1. To impart knowledge in the scope and limitations of Telemedicine
2. To understand the security, standards and errors during the transmission of bio signals

UNIT I Introduction to Telemetry system 9

Principle, Functional Blocks of Telemetry, Tele control system, Methods of telemetry, Basic components and types, Clinical telemetry-computerized patient monitoring system, central monitoring system.

UNIT II Telemedicine and Standards

History and evolution of Telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine. Telemedical standards-, Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), Administration of centralized medical data, , Cyber laws

Unit III Telemedical Technology 9

Data communication and networks-use of computers in distance mode of health care delivery, Videoconferencing, Web technology capturing of medical signals, Analog to Digital conversion. Networking (local, national& global)Data Security and Standards: Encryption, Cryptography.

UNIT IV Mobile Telemedicine 9

Teleradiology: Definition, Basic parts of Teleradiology system: Image Acquisition system Display system, Telepathology, multimedia databases, color images of sufficient resolution, Dynamic range, spatial resolution, compression methods, Interactive control of color, Medical information storage and management.

Unit V Telehealth Applications 9

Telemedicine access to health care services – health education and home care. Introduction to robotics surgery, telesurgery. Telecardiology, Tele oncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability

Total Hours: 45

Practicals:

1. Acquisition and transmission of bio signals
2. Design of transmitter and receiver system
3. Telemetry in Ophthalmology, Radiology and surgery
4. Mobile telemedicine

Total Hours: 30

Reference books:

1. Olga Ferrer-Roca, M. SosaLudicissa (2002), *Handbook of Telemedicine*, IOS press.
2. B.D. Gupta (2004), *Introducing Telemedicine (Applications, challenges, needs and benefits, components and infrastructure)*, Deep & Deep Publications Pvt. Ltd.
3. A.C. Norris. (2002), *Essentials of Telemedicine and Telecare*, Wiley.
4. Marlene Maheu, Pamela Whitten, Ace Allen (2002), *E-health, Telehealth and Telemedicine*, John Wiley and sons.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the fundamentals of Telehealth technology.
- CO2** : Apply multimedia technologies.
- CO3** : Explain the protocols behind encryption techniques of secure transmission of data.
- CO4** : Acquire knowledge in mobile telemedicine.
- CO5** : Design a transmitter and receiver system.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	M	H	H	L	H	H	H	H	H	H	L	L
CO2	H	M	H	H	L	H	H	H	H	H	H	L	L
CO3	H	M	H	H	L	H	H	M	H	H	H	L	L
CO4	H	M	H	H	L	H	H	H	H	H	H	L	L
CO5	H	M	H	H	L	H	H	M	H	H	H	L	L

Troubleshooting of Medical Equipment

Semester V
24VMTS07

Hours of Instruction/week: 6T+11P
No. of credits: 12

Objective:

1. To impart knowledge in maintenance and troubleshooting of medical equipment.

Unit I Fundamentals of Troubleshooting

18

Fundamental troubleshooting procedures - Causes of equipment failure - Troubleshooting process & fault-finding aids - Techniques involved - Grounding systems in electronic equipment - Temperature Sensitive Intermittent problems - Correction action.

Unit II Preventive Maintenance

18

Biomedical Equipment maintenance - Purchase policy - Setup requirement - Incoming equipment inspection - Assembling and Installation - Calibration (manufacturer's recommendation), History card, Levels of maintenance - Technician and Equipment - Evaluation - Service - Control and Safety - Inspection and Testing, reduce repetition of errors - Manuals in fluent language - SOP for Assembling and Disassembling - Log book and Labeling.

Unit III Troubleshooting Procedures

18

Operating & service manuals - Planning task - Log book entry and fault analysis - Repair service - Contract management - Consumables and spares supply - inventory management, Equipment service - CE Certifications - Standards for medical devices - Signs and Symbols Follow safety procedures - Types of protection materials (PPE), Handling Hazardous materials, Situation, Analyze and Evaluation

Unit IV Troubleshooting of Diagnostic and Therapeutic Equipment

18

Stethoscope - Sphygmomanometer - Nebulizer - Centrifuge - Microscope - Blood collection monitor - ECG - PCG - EEG - EMG - EOG - Audiometer - TENS - Ultrasound therapy Unit - Shortwave diathermy - Microwave diathermy - Surgical diathermy.

Unit V Troubleshooting of Intensive and Supportive Equipment

18

Radiant heat warmer - Baby Incubator - Phototherapy - Defibrillator - Ultrasound Scanner - Endoscopy - Spirometer - Ventilator - Suction apparatus - Pulse Oximeter - Drug delivery device - Patient warmer - OT table & light - Autoclave.

Total Hours: 90
Skill Training: 165

Reference:

1. Ministry of Health and Family Welfare, New Delhi (2010), "*Medical Equipment Maintenance Manual*" – A first line maintenance guide for end user

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Acquire the knowledge of troubleshooting methods and apply the skills in Equipment.
CO2 : Follow Standard Operating Procedures apply the skills in maintenance, Installation, Testing and documentation of medical Equipment.
CO3 : Follow troubleshooting procedures as per the manufacturer's recommendation.
CO4 : Apply standards for troubleshooting and evaluate the performance of the Diagnostic and Therapeutic Equipment.
CO5 : Apply standards for troubleshooting and evaluate the performance of the Intensive and Supportive care Equipment.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	L	L	H	L	M	H	H	H	M	M	H	H
CO2	M	M	L	H	M	L	L	M	M	L	L	H	H
CO3	M	M	L	L	M	L	L	M	M	L	L	H	H
CO4	H	M	M	H	H	M	M	H	L	M	M	H	H
CO5	H	M	M	H	H	M	M	H	L	M	M	H	H

Skill Training in Hospital - III

Semester V
24VMTS08

Hours of Instruction/week: 6T+11P
No. of credits: 12

Objective:

To impart adequate knowledge in Maintenance and Troubleshooting of Biomedical equipment.

UNIT I Introduction 18

Role of Biomedical supervisor – Roles and responsibilities, supervise the activities of the department, Prepare work schedules

UNIT II Co-ordinate with colleagues 18

Evaluate staff productivity and quality performance indices, Auditing and corrective measures, organize training and workshops, and prepare assessment reports, working relationships.

UNIT III Inventory Management 18

Recommendation of renovation and replacement of equipment, follow purchase procedures, inventory of consumables and spares, documentation

UNIT IV Quality Management 18

Analyze the Quality of equipment, Knowledge of Codes and Standards, collaborate with support entities, follow best practices, Inspection and testing, reduce repetition of errors, documentation

Unit V Maintain a safe, healthy and secure work environment 18

Follow safety procedures, understand work requirements, coordinate with co-workers, Electrostatic discharge, types of protection materials – gloves, goggles, Lead Aprons, mask, handling hazardous materials and situations, Analyze and evaluation, Infection control policies and procedures.

Total Hours: 90
Skill Training: 105

Text book:

1. **S.L. Goel R. Kumar (2007), *Hospital Administration & Management*, Deep & Deep Publications**

Reference

1. ELE/Q7901 Qualifications Pack- *Quality Engineer*, Occupational Standards of Electronic Industry, Electronic Sector Skill Council of India, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the roles and responsibilities of a biomedical supervisor.
- CO2** : Describe the administrative and managerial skills.
- CO3** : Illustrate the purchase procedures for inventory management.
- CO4** : Follow best practices to achieve quality.
- CO5** : Practice safe, healthy and secure environment.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	H	H	H	H	M	H	H	H	H	H	L	L
CO2	H	H	H	H	H	M	H	M	L	H	H	L	M
CO3	H	M	M	L	L	H	H	M	H	M	H	M	M
CO4	H	M	H	M	H	M	M	H	M	H	H	H	H
CO5	H	H	H	H	H	L	M	H	M	M	H	H	H

Hospital System Management

Semester VI
24VMTC14

Hours of Instruction/week: 3T+2P
No. of credits: 4

Objective:

1. To impart knowledge about the organization and governance of healthcare industry
2. To understand the role of supporting services for the effective and efficient management

UNIT I Classification and Planning of Hospital 9

Evolution of healthcare system, Epidemiology - concept of health, Concept of hospital management, Classification of Hospitals, Role of Administrator, Primary Health Centre. Hospital Design: Aspects of Hospital Services. Organization of ancillary services – laboratory, blood transfusion, radio-diagnosis, physiotherapy, occupational therapy, pharmacy, nursing, dietary, transport and communication in the hospital

UNIT II Hospital Supporting Systems 9

Staffing the hospital, financing health services, Resource mobilization, Organization of auxiliary services - Human Resource Development, Marketing, Purchase, Biomedical engineering departments, Maintenance - Electrical system, Generator standby power, Air conditioning system, Water supply and sanitary system, Fire Fighting system, Laundry, Housekeeping, Emergency Services

UNIT III Biomedical Waste & Disaster Management 9

Hospital Acquired Infection: Types – Common Nosocomial Infection and their Causative Agents, Prevention methods – Infection Control Committee – Monitoring & Control. Biomedical Waste types, Segregation, Packaging, Transportation, Storage & disposal. Modern Sewage Treatment. Disaster Management-Threats, Prevention, Mitigation and National policy for disaster Management

UNIT IV Hospital Information System 9

Hospital information system and management, Radiology Information system, PACS, Electronic medical records (EMR), ICU, OT, IP ward, Admission/ Discharge records of patients, Patient billing, Maintenance of patients records.

Unit V Certification and Accreditation 9

Introduction to Quality Department, Introduction to Certification and Accreditation, ISO, NABH, JCI, Canadian. Hospital Architecture, Medical Ethics - Basic issues and Importance, Legal aspects of healthcare - Labour, Consumer, Drug.

Total Hours: 45

Practicals:

1. HRD
2. HAI
3. Admission and Discharge
4. Hospital Architecture

Total Hours: 30

Reference books:

1. Joseph Kh& Tan Ph. D (2000), *Health management information system methods and practical applications*. Jones and Bartlett.
2. S.L. GoelR. Kumar (2007), *Hospital Administration & Management*, Deep & Deep Publications.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Understand the basic planning, designing and organization of hospitals.
- CO2** : Describe the clinical and administrative supportive services.
- CO3** : Acquire knowledge in Biomedical waste, Infection control and Disaster management.
- CO4** : Illustrate the Hospital Information systems.
- CO5** : Practice the certification and Accreditation standards and Medical ethics.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO11	PSO 1	PSO 2
CO1	H	H	H	H	H	M	H	H	H	M	H	L	L
CO2	H	H	H	H	H	L	M	H	H	H	H	L	L
CO3	H	M	M	H	H	M	M	H	H	H	H	L	L
CO4	H	M	H	H	M	H	M	H	M	M	H	M	M
CO5	H	L	H	H	L	M	L	M	H	M	H	M	H

Testing, Calibration and Maintenance of medical equipment

Semester VI
24VMTS10

Hours of Instruction/week: 6T+7P
No. of credits: 10

Objective:

1. To understand troubleshooting of electrical and electronic equipment.
2. Apply the tools in design, testing and developing medical equipment.

UNIT I Introduction to Calibration

18

Calibration - Definition - Importance - Procedure - Steps - Types - Electrotechnical Calibration - Non-electrical Calibration - Onsite Calibration - Medical Equipment Calibration.

UNIT II Testing of Electrical Components

18

Electrical safety - Definition - Standards - Basic testing - Power supply - AC & DC - Grounding - Shielding - Guarding - Insulating testing - Insulation resistance measurement, Circuit breakers - Testing - Types, Transformer testing, Earthing - Earth wires, Earthing of appliances - Contactor - Relay - CT & PT - Panel wiring - Megger - Testing equipment and Instruments, Case Study.

UNIT III Testing of Electronic Components

18

Troubleshooting of PCB Boards - Calibration of Analog & Digital sensor probe - Display interface - DC Power supply - Testing - Safe electrical practice - Cable & Standard - Fuse, Case Study.

UNIT IV Reliability in Medical Devices

18

Need - Tools - MTBT - MTTR - FMEA - Fault analysis - cause failure analysis - Markov method, Human errors in healthcare systems - Human factors to reduce error, quality assurance through regulatory complaints - ISO 9000 - FDA - IEEE - ASTM - UL - CE, Computerized maintenance management system for medical equipment, case study.

UNIT V Maintenance Management

18

Introduction - Procedure - Levels and types of maintenance, Contract management - AMC - CMC, Job order, Life cycle management of medical equipment, Cost of the equipment - Maintenance cost, replacement analysis, managing equipment service - Condemnation, Case study.

Total Hours: 90

Skill Training: 105

Reference:

1. Rao S (2014), *“Testing, Commissioning, Operation and maintenance of electrical equipment”*, Khanna publishers, New Delhi.
2. Shakti Chatterjee, Aubert Miller (2010), *“Biomedical Equipment repair”*, Cengage Learning technology and Engineering.
3. David Herras (2013), *“Troubleshooting and repairing commercial electrical equipment”*, Mc Graw Hill Professional.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Identify the reason for equipment failure.
- CO2** : Interpret need for grounding aspects, maintenance and troubleshooting.
- CO3** : Compare various standards and specifications.
- CO4** : Decide quality standards.
- CO5** : To analyze the maintenance schedule of medical equipment.

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	H	M	H	H	M	H	M	M	H	H	H	H	H
CO2	H	M	M	M	L	H	M	M	H	H	H	H	H
CO3	H	L	L	L	L	H	M	L	H	M	H	H	H
CO4	H	M	L	L	L	H	L	L	H	M	H	H	H
CO5	H	M	M	H	H	H	M	M	H	H	H	H	H

Skill Training in Hospital - IV

Semester VI
24VMTS11

Hours of Instruction/week: 6T+7P
No. of credits: 10

Objective:

To impart adequate knowledge in the handling of patients with reference to the National Occupational Standards framed by HSSC.

1. HSS/ N 6112: Supervise in house operations to meet organizational objectives
2. HSS/ N 6113: Redirect & allocate resources according to patient flow
3. HSS/ N 6114: Undertake corrective action in case of non-compliances in accordance to hospital policy, administration and work rules
4. HSS/ N 6115: Support clinical, operational and facility services for smooth functioning throughout the entire organization on a 24-hour basis
5. HSS/ N 9615: Maintain interpersonal relationship with colleagues, patients and others
6. HSS/ N 9616: Maintain professional and medico-legal conduct
7. HSS/ N 9617: Maintain a safe, healthy and secure working environment
8. HSS/ N 9618: Follow biomedical waste disposal and infection control policies and procedures

Total Hours: 90
Skill Training: 105

References:

1. HSS/Q6104 Qualifications Pack - *Duty Manager -Patient Relation Services*, Occupational Standards of Healthcare Sector Skill Council, New Delhi.

Course Outcomes:

At the end of the course, the students will be able to:

- CO1** : Supervise in house operations to meet organizational objectives
- CO2** : Carry out effective utilization of resources as per organizational needs
- CO3** : Undertake corrective action in case of non-compliances in accordance to hospital policy, administration and work rules
- CO4** : Plan, perform and conduct training sessions regularly for others regarding process compliance, initiatives or promotions
- CO5** : Exhibit skills in terms of team supervision, administrative support, supervisory support, office harmony, crisis handling and customer service

CO, PO MAPPING

COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	L	H	H	H	H	L	L	M	L	M	H	H	H
CO2	L	H	H	H	H	L	L	M	L	M	H	H	H
CO3	L	H	H	H	H	L	L	M	L	M	H	H	H
CO4	L	H	H	H	H	L	L	M	L	M	H	H	H
CO5	L	H	H	H	H	L	L	M	L	M	H	H	H