



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A++' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai -410 209

Tel 022-27432471, 022-27432994, Fax 022 -27431094

E-mail: registrar@mgmuhs.com; Website : www.mgmuhs.com

CHOICE BASED CREDIT SYSTEM (CBCS)

(with effect from 2025-2026 Batches)

Curriculum for M.Sc. Health Informatics

Amended as per AC-52/2025, Dated 28/11/2025

Amended History

1. Amended as per AC-51/2025, [Resolution No.3.1(Annexure-3.14)], [Resolution No.3.5, (Annexure-7)]; Dated 29/04/2025.
2. Amended as per AC-52/2025, [Resolution No.5.1(Annexure-17N)]; Dated 28/11/2025.

Resolution No. 3.1 of Academic Council (AC-51/2025):

Resolved to approve the CBCS syllabus, including Program Outcomes (POs), Course Outcomes (COs), and PO-CO Mapping for 15 two-year postgraduate programs under MGMSBS for Semesters I and II. These include: M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Clinical Embryology, M.Sc. Clinical Nutrition, M.Sc. Medical Dialysis Technology, M.Sc. Molecular Biology, M.Sc. Medical Radiology & Imaging Technology, M.Sc. Cardiac Care Technology, M.Sc. Operation Theatre and Anaesthesia Technology, M.Sc. Emergency and Trauma Care, M. Optometry, Master in Hospital Administration, Master of Public Health, **M.Sc. Health Informatics** & M.Sc. Clinical Research to be effective from batch admitted in Academic Year 2025-26 onwards [ANNEXURE-3.1 to 3.30].

**Annexure-3.14 of AC-51/2025****MGM SCHOOL OF BIOMEDICAL SCIENCES**

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel. No.:022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/Website: www.mgmsbsnm.edu.in

CHOICE BASED CREDIT SYSTEM (CBCS)

(Academic Year 2025 - 26)

Curriculum for

M.Sc. Allied Health Sciences

M.Sc. Health Informatics

Semester I & II

DIRECTOR'S MESSAGE

Welcome Message from the Director

Dear Postgraduate Students,

Welcome to **MGM School of Biomedical Sciences (MGMSBS)**, **MGMIHS**, a premier institution dedicated to advancing allied and health sciences education. As you embark on this transformative academic journey, you are joining a community that fosters excellence in research, clinical expertise, and innovation.

MGMIHS, accredited with NAAC 'A⁺⁺' **Grade (CGPA 3.55, 2022)** and recognized as a **Category I Institution by UGC**, offers an ecosystem that nurtures both academic and professional growth. With **NIRF (151-200 rank band) recognition**, **NABH-accredited hospitals**, **NABL-accredited diagnostic labs**, and **JCI accreditation for MGM New Bombay Hospital**, we uphold global benchmarks in education and healthcare.

At MGMSBS, our **15 postgraduate programs** are meticulously designed to align with the National Commission for Allied and Healthcare Professionals (**NCAHP**) standards, National Education Policy (**NEP**) 2020, and the National Credit Framework (**NCrF**). We have implemented the **Choice-Based Credit System (CBCS)** to provide academic flexibility while ensuring rigorous training in clinical and technical skills. Our state-of-the-art research laboratories, digital classrooms, and the Central Research Laboratory (CRL) foster an environment that encourages innovation and evidence-based learning.

Postgraduate education at MGMSBS goes beyond theoretical learning—our curriculum integrates **hands-on clinical training, interdisciplinary collaboration, and exposure to real-world healthcare challenges**. We emphasize **research-driven education**, encouraging students to actively participate in **scientific discoveries, publications, and international collaborations**.

Beyond academics, we believe in **holistic development**, with initiatives such as the **AARAMBH Science and Wellness Club**, which promotes **mental well-being, leadership, and professional networking**.

As you step into this **next phase of academic and professional growth**, we encourage you to explore new ideas, engage in impactful research, and contribute meaningfully to the **healthcare ecosystem**. We are confident that your journey at MGMSBS will shape you into **skilled, compassionate, and visionary professionals**, ready to lead in the ever-evolving healthcare landscape.

We look forward to witnessing your achievements and contributions!

Dr. Mansee Thakur

Director, MGM School of Biomedical Sciences
MGM Institute of Health Sciences, Navi Mumbai

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences through meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGMIHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well-equipped labs. The school encompasses 23 courses each with its own distinct, specialized body of knowledge and skill. This includes 8 UG courses and 15 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately **800** at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately, they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus, the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reformation is essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Introduction

Most healthcare leaders know that trustworthy data is critical to improving business performance and patient care. But it's still a challenge to put that data to work in service of better care and more informed decision making. The ability to effectively analyse and deploy this data is critical to the successful operation of healthcare organizations.

Health Informatics is an interdisciplinary field that combines healthcare, information science, and computer technology to optimize the acquisition, storage, retrieval, and use of health-related data. It focuses on improving patient outcomes, enhancing healthcare delivery systems, and fostering innovation in the use of data and technology in medicine.

Health Information Management (HIM), on the other hand, emphasizes the management of health records, ensuring their accuracy, confidentiality, and compliance with regulatory standards. HIM professionals are responsible for organizing and safeguarding patients' medical information to ensure it is readily available for effective decision-making and quality healthcare delivery.

The integration of these fields creates a robust foundation for addressing contemporary healthcare challenges, such as the rise of electronic health records (EHRs), telemedicine, big data analytics, and health information exchange. This Master's program is designed to equip students with the knowledge and skills necessary to become leaders in this transformative domain.

AIM of the Program

The Master's in Health Informatics program aims to:

- Prepare students to effectively integrate information technology and data analytics into healthcare practices.
- Develop competencies in managing and analyzing health information to enhance clinical decision-making and operational efficiency.
- Foster a deep understanding of regulatory, ethical, and privacy issues associated with health information systems.
- Equip graduates with the skills to design, implement, and manage innovative health informatics solutions that address real-world challenges.
- Provide a strong foundation in interdisciplinary collaboration, leadership, and strategic planning for health informatics initiatives.
- Ensure proficiency in managing health information systems, focusing on data quality, security, and compliance with healthcare regulations.
- Train students in developing strategies for efficient healthcare documentation and coding, supporting better resource utilization and patient care delivery.

Job Opportunities (Traditional and Non-traditional Settings)

Graduates of this program will have diverse career opportunities in both traditional and non-traditional healthcare settings:

Traditional Settings:

- **Hospitals and Healthcare Systems:** Roles such as Health Information Managers, Clinical Informatics Specialists, Nursing informatics specialist, Clinical analyst, EHR Implementation Consultants and Informatics director.
- **Public Health Agencies:** Positions like Public Health Data Analysts and Population Health Informatics Specialists.

- **Academic and Research Institutions:** Careers as Health Informatics Educators or Clinical Data Researchers.
- **Government Organizations:** Opportunities in policy-making and health informatics standard development.
- **Healthcare Facilities:** Roles like Medical Record Managers, Medical and Health Service Managers, Coding Specialists, and Data Quality Officers to ensure accurate and compliant health records management.

Non-traditional Settings:

- **Health Technology Companies:** Positions such as Product Managers, UX Designers for health applications, and Health IT Consultants.
- **Pharmaceutical and Biotech Industries:** Roles in clinical trial informatics, drug development analytics, and regulatory compliance.
- **Insurance Companies:** Careers as Healthcare Data Analysts or Actuarial Informatics Specialists.
- **Telemedicine and Remote Health Services:** Opportunities in designing and managing virtual care platforms.
- **Entrepreneurship:** Founding or leading start-ups focused on health IT solutions, wearable health devices, or patient engagement tools.
- **Data Science and Artificial Intelligence:** Roles in developing predictive models and machine learning applications for healthcare.
- **Consultancy Services:** Providing expertise in medical record audits, compliance reviews, and health information system optimizations.

ELIGIBILITY FOR ADMISSION:

Any health science graduates with MBBS/BAMS/BHMS/BDS/Nursing/Allied Health Sciences or equivalent with minimum aggregate of 50% marks.

DURATION OF THE COURSE: 2 (two) academic years/4 semesters

M.Sc. Health Informatics

Program Outcomes (PO)

Program Code	Program Objective(s)
PO1	Apply foundational knowledge in health and medical sciences to develop informatics solutions
PO2	Utilize biostatistics and research methodology to drive data driven healthcare innovations and conduct research
PO3	Implement health information management practices in various healthcare settings
PO4	Harness Advanced Computing Skills to Develop and Manage Innovative Health Informatics Projects
PO5	Demonstrate effective communication skills within healthcare environments, critical thinking and ethical reasoning to address societal challenges, uphold human rights, manage crises, and apply bioethical principles in healthcare and research.
PO6	Integrate healthcare financing principles in health informatics initiatives
PO7	Employ data analytics and machine learning techniques for improved healthcare outcomes
PO8	Design and develop web and mobile applications for healthcare purposes and identify business opportunity.

Semester I

MHIMT 101 T	Basics of Health Informatics & Health Information Management	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Develop a comprehensive understanding of healthcare systems and the role of health information in improving patient care.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Gain proficiency in managing health records, including the legal aspects, documentation, and quality control.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Demonstrate mastery in the use of health informatics technologies, such as EHRs, CDSS, and HIE, and ethical, legal, and regulatory issues associated with health information and informatics.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO4	Explore emerging trends in health informatics and their implications for future healthcare.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO5	Apply theoretical knowledge to practical scenarios in health information management and informatics.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MHIMT 102 T	Hospital Administration and Healthcare Financing	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand and apply healthcare management principles and policies.	PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Analyze the financial management strategies and budgeting within healthcare organizations.	PO6	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Implement quality improvement and patient safety protocols.	PO3, PO5	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO4	Navigate health economics, healthcare finance, and insurance systems.	PO6	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO5	Develop skills in resource tracking, management, and financial auditing in the healthcare sector.	PO3, PO6	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment

CC 001 T & CC 001 P	Research Methodology & Biostatistics (Core Course)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the basic concepts of biostatistics and their application in research	PO2	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Theory Exam, Practical Exam), Assignment
CO2	Describe the appropriate statistical methods required for a particular research design	PO2	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Theory Exam, Practical Exam), Assignment
CO3	Develop an appropriate framework for research studies and Data Analysis	PO2	Lecture, Demonstration, Practical, Assignment, Seminar	Internal Exam, University Exam (Theory Exam, Practical Exam), Assignment
MHIMT 103 E	Fundamentals of Computer Application (Experiential)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the basics of computer hardware and software, various windows accessories and the functioning of the control panel	PO4	Practical, Experiential, Assignment, Problem Based Learning, E-learning	University Exam (Experimental), Viva-Voice
CO2	Demonstrate Skill in essential Microsoft Office applications	PO4	Practical, Experiential, Assignment, Problem Based Learning, E-learning	University Exam (Experimental), Viva-Voice
CO3	Apply database management system concepts when designing the different database objects.	PO4	Practical, Experiential, Assignment, Problem Based Learning, E-learning	University Exam (Experimental), Viva-Voice
CO4	Demonstrate Skill in Using Computer Networks, network topologies and Devices.	PO4	Practical, Experiential, Assignment, Problem Based Learning, E-learning	University Exam (Experimental), Viva-Voice
CO5	Understanding about emerging computer technologies like Blockchain, Machine Learning.	PO4	Practical, Experiential, Assignment, Problem Based Learning, E-learning	University Exam (Experimental), Viva-Voice
MHIMT 104 P	Python Basics	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Develop a solid understanding of Python's syntax and semantics, including data types, variables, operators, and basic control structures.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice
CO2	Demonstrate Competency in working with Python's core data structures, including lists, ranges, tuples, dictionaries, and sets.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice
CO3	Handle input and output operations in Python, including reading from	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam,

	and writing to files, and interacting with user input in a robust manner.			(Practical Exam), Viva-Voice
CO4	Apply the principles of modular programming by defining and using functions, including the use of parameters, return values, and variable scope.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice
CO5	Acquire the ability to implement object-oriented programming concepts in Python, such as classes, objects, inheritance, and polymorphism, to create reusable and maintainable code.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice
CO6	Master the techniques for managing errors and exceptions in Python, ensuring that programs can handle unexpected situations gracefully and continue to operate correctly.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice
CO7	Explore the use of regular expressions in Python for pattern matching and text processing, gaining the ability to handle complex string manipulation tasks.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam, (Practical Exam), Viva-Voice

Semester II

MHIMT 105 T & MHIMT 109 E	Advanced Health Informatics & HI Practicum	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the management of various advanced health informatics applications	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO2	Interpret the application of health informatics for managing patient data and supporting healthcare professionals in making a quality decision	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO3	Describe the content and features to be included in the informatics application to the application developer in making advance and expert informatics application	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO4	Identify the trends and emerging technology for informatics application in healthcare settings.	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO5	Recognize the future requirement using various approaches and prediction tools	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO6	Develop awareness, understanding and capacity in the specific roles and responsibilities of a health information management professional	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO7	Understand through an intensive experience the nature of hospitals and health care settings as workplaces and their associated values, routines and cultures	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO8	Develop skill and professional capacity for managing the health information system of a health care setting	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
CO9	Develop competency to plan, implement, and carry out a clinical	PO1, PO3, PO5	Lecture, Demonstration, Experiential, Group Discussion, Assignment,	Internal Exam, University Exam (Theory Exam,

	audit in the quality assurance cell		Seminar, Problem Based Learning, E-learning, Case-Study	Experimental), Logbook
CO10	Demonstrate competency to plan, implement, and carry out a claims processing in the health insurance department	PO1, PO3, PO5, PO6	Lecture, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study	Internal Exam, University Exam (Theory Exam, Experimental), Logbook
MHIMT 106 T	Clinical Workflow, Process Redesigning & Clinical Documentation Improvement (CDI)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the concepts and importance of clinical workflow and process redesign, including the role of Clinical Documentation Improvement (CDI) programs and CDI specialists.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
CO2	Identify focus areas for medical documentation improvements and the benefits of CDI programs.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
CO3	Apply workflow analysis techniques to evaluate and document clinical processes, creating process maps to visualize workflows.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
CO4	Identify bottlenecks, inefficiencies, and areas for improvement in clinical processes, and apply knowledge of CDI metrics to measure improvement outcomes.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
CO5	Develop & Implement a plan for clinical process redesign, incorporating change management strategies to facilitate workflow optimization.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, Internal Exam, (Theory Exam) Seminar, Assignment
CO6	Apply various processes of a CDI program in both inpatient and outpatient settings, leveraging technology to enhance clinical workflow.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
CO7	Evaluate the role of technology in clinical workflow enhancement and apply CDI principles to improve documentation practices and quality metrics.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam) Seminar, Assignment
MHIMT 107 T &	Medical Language & International Classification of Disease Coding (Theory +	Mapped POs	Teaching-Learning Methodologies	Assessment Tools

MHIMT 110 P	Practical)			
CO1	Describe medical terminologies and their components, including stem words/root, prefixes, and suffixes.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO2	Explain the concepts of body systems and identify the terminologies related to body systems, diseases, diagnostic, therapeutic tests, and procedures.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO3	Enumerate surgical procedures, diseases, disorders, and dysfunctions.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO4	Develop an understanding of medical abbreviations, signs and symptoms and common medical terms.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO5	Apply the principles of medical coding using various coding systems.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO6	Explain how the disease classification system integrates with health information systems and supports healthcare data management.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
MHIMT 108 T & MHIMT 111 P	Medical Transcription & Editing (Theory + Practical)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand medical report formats, transcription principles, editing and proofreading rules specific to medical content.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
CO2	Develop skill and knowledge to accurately transcribe and edit	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group	Internal Exam, University Exam, (Theory Exam,

	health-related information		Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study, Guest Lecture	Practical Exam), Viva-Voice
CO3	Demonstrate Skill in using natural language processing and other transcription software and applications in Medical Transcribing.	PO1, PO3	Lecture, Practical, Demonstration, Experiential, Group Discussion, Assignment, Seminar, Problem Based Learning, E-learning, Case-Study, Guest Lecture	Internal Exam, University Exam, (Theory Exam, Practical Exam), Viva-Voice
DSE 001 P	Web Development Basics (Practical)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the fundamental concepts of web development.	PO8	Practical, Assignment, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Demonstrate skill in front-end and back-end web development.	PO8	Practical, Assignment, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Develop Skill to create responsive and dynamic websites.	PO8	Practical, Assignment, Problem Based Learning, E-learning, Guest Lecture	Internal Exam, University Exam (Practical Exam), Viva-Voice
DSE 002 P	Advanced Python (Practical)	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understanding the core principles and exploring advanced features and libraries of Python	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Develop ability to implement multithreaded programs in Python, intricacies of concurrent execution and thread management to improve application performance.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Demonstrate Skill in using Python for database interactions, including connecting to databases, executing queries, and managing data using libraries such as SQLite, MySQL, and Postgre SQL.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO4	Utilize Python for data analysis tasks, including data manipulation, statistical analysis, and visualization using libraries such as NumPy, pandas, and Matplotlib.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice

OUTLINE OF COURSE CURRICULUM

M.Sc. Health Informatics

Semester I

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MHIMT 101 T	Basics of Health Informatics & Health Information Management	3	-	-	-	3	45	-	-	-	45	20	80	100
MHIMT 102 T	Hospital Administration and Healthcare Financing	4	-	-	-	4	60	-	-	-	60	20	80	100
CC 001 T	Research Methodology & Biostatistics (Core Course)	3	-	-	-	3	45	-	-	-	45	-	50	50
Discipline Specific Core Practical / Experiential														
MHIMT 103 E	Fundamentals of Computer Application	-	-	-	12	4	-	-	-	180	180	-	50	50
MHIMT 104 P	Python Basics	-	-	8	-	4	-	-	120	-	120	10	40	50
CC 001 P	Research Methodology & Biostatistics (Core Course)	-	-	4	-	2	-	-	60	-	60	-	50	50
Total		10	0	12	12	20	150	0	180	180	510	50	350	400

OUTLINE OF COURSE CURRICULUM

M.Sc. Health Informatics

Semester II

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MHIMT 105 T	Advanced Health Informatics & HI Practicum	3	-	-	-	3	45	-	-	-	45	20	80	100
MHIMT 106 T	Clinical Workflow, Process Redesigning & Clinical Documentation Improvement (CDI)	3	-	-	-	3	45	-	-	-	45	20	80	100
MHIMT 107 T	Medical Lanaguage & International Classification of Disease Coding	3	-	-	-	3	45	-	-	-	45	20	80	100
MHIMT 108 T	Medical Transcription & Editing	2	-	-	-	2	30	-	-	-	30	20	80	100
Discipline Specific Core Practical / Experiential														
MHIMT 109 E	Advanced Health Informatics & HI Practicum	-	-	-	9	3	-	-	-	135	135	-	50	50
MHIMT 110 P	Medical Lanaguage & International Classification of Disease Coding	-	-	4	-	2	-	-	60	-	60	10	40	50
MHIMT 111 P	Medical Transcription & Editing	-	-	4	-	2	-	-	60	-	60	10	40	50
Discipline Specific Elective														
DSE 001 P	Web Development Basics (Optional 1)	-	-	6	-	3	-	-	90	-	90	10	40	50
DSE 002 P	Advanced Python (Optional 2)	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		11	0	14	9	21	165	0	210	135	510	110	490	600

T- Theory, P- Practical, E- Experiential

FIRST YEAR

M.Sc. Health Informatics

SEMESTER-I

Code No.	Core Subjects
Discipline Specific Core Theory	
MHIMT 101 T	Basics of Health Informatics & Health Information Management
MHIMT 102 T	Hospital Administration and Healthcare Financing
CC 001 T	Research Methodology & Biostatistics (Core Course)
Discipline Specific Core Practical / Experiential	
MHIMT 103 E	Fundamentals of Computer Application
MHIMT 104 P	Python Basics
CC 001 P	Research Methodology & Biostatistics (Core Course)

Name of the Program	M. Sc. Health Informatics
Semester	Semester I
Name of the Subject	Basics of Health Informatics & Health Information Management
Subject Code	MHIMT 101 T

Learning Outcomes	<ul style="list-style-type: none"> • Understanding about healthcare delivery system and digital initiatives in India. • Understanding about Health Information management in various settings, Good medical records and recent advances in HIM • Understanding about Medical record management principles and techniques and applying them. • Analyzing various organizational aspect of HIM Services • Understanding and analyzing management of health data and Quality control • Understanding and applying statistical techniques to process health data • Understanding and analysis the need of computerized systems • Understanding and applying of various record keeping techniques • Understanding about Health Informatics and its impact on healthcare delivery • Understanding and analysis of various Health Information Systems, interoperability among various HISs and regulatory issues • Understanding and evaluating the emerging trends and future health informatics technologies • Understanding and evaluate the future trends shaping the future of HI
Course Outcomes	<ul style="list-style-type: none"> • Develop a comprehensive understanding of healthcare systems and the role of health information in improving patient care. • Gain proficiency in managing health records, including the legal aspects, documentation, and quality control. • Demonstrate mastery in the use of health informatics technologies, such as EHRs, CDSS, and HIE, and ethical, legal, and regulatory issues associated with health information and informatics. • Explore emerging trends in health informatics and their implications for future healthcare. • Apply theoretical knowledge to practical scenarios in health information management and informatics.

Sr. No.	Topics	No. of Hrs.
1	Healthcare delivery system – An Overview <ul style="list-style-type: none"> • Description of the organization and structure of healthcare in India • Funding mechanisms in India (out of pocket, private insurance, public insurance) • Digital health initiatives in India 	2
2	Introduction to Health Information Management <ul style="list-style-type: none"> • Definition, Goals & Objective, Characteristics, Purpose, Values of Health 	3

	<p>Information Management to the various users</p> <ul style="list-style-type: none"> • Definition, Characteristics & values of 'Good' Medical Record • Required Characteristics of entries in medical Records • Medical records in specific settings- emergency & outpatient records, Clinical Records in Long Term Care and Rehabilitation Facilities • Recent Advances in Health Information Management 	
3	<p>Medical Record Management</p> <ul style="list-style-type: none"> • Numbering and Filing Systems • Storage- Microfilming and Disk Storage • Types of medical records • Color Coding of Medical Records. • Definition, Reason, Types, Advantages of various Storage mediums • Retention of Medical Records • Registers & Indexes • Definition, Purpose, Contents & standard order of arrangement of various forms used to document the patient health information (including various rules involved in form designing) • Principal Responsibilities and Duties of the Medical Record Administrator /Director 	5
4	<p>Organizational Aspects of a Health Information Management Department/Services</p> <ul style="list-style-type: none"> • Policies • Functions • Location, Space and Layout • Equipment 	2
5	<p>Management and Quality Control of Health Information Management</p> <ul style="list-style-type: none"> • Movement and Control of various medical records in hospital and Health Information Management department & Tracking systems • Various physical facilities required for the maintenance of Health Information Management, • Basic rules for the handling of Health Information Management in health care facilities. • Incomplete Record Control 	4
6	<p>Health Care Statistics, Data Collection & Presentation</p> <ul style="list-style-type: none"> • Inpatient census and rates computed from it • Ambulatory care statistics, Long term Care Statistics • Processing and reporting of vital Statistics • Reporting of Notifiable Diseases to Public Health Authorities 	2
7	<p>Computerization of Health Information Systems</p> <ul style="list-style-type: none"> • Needs of computerization • Process involved in computerization • Advantages and Disadvantages 	2
8	<p>Introduction to Health Informatics</p> <p>Overview of Health Informatics</p> <ul style="list-style-type: none"> • Definition of health informatics and its evolution • Importance of health information technology (IT) in modern healthcare • Role of health informatics in improving patient care and organizational efficiency <p>Key Players and Stakeholders</p> <ul style="list-style-type: none"> • Identification of key stakeholders in health informatics • Roles and responsibilities of healthcare providers, IT professionals, policymakers, and patients • Inter professional Collaborative Practice (ICP) among stakeholders for effective health IT implementation 	4

	<p>Impact of Health Information Technology</p> <ul style="list-style-type: none"> • How health IT supports patient care and enhances clinical workflows • Case studies illustrating the impact of health IT on healthcare organizations • Challenges and opportunities in adopting health IT solution 	
9	<p>Core Topics in Health Informatics</p> <p>Electronic Health Records (EHR)</p> <ul style="list-style-type: none"> • Definition and components of EHR systems • Benefits and challenges of EHR adoption in healthcare settings • Regulatory requirements (e.g., HIPAA) and standards for EHR implementation • PACS, LIS, RIS <p>Health Information Exchange (HIE)</p> <ul style="list-style-type: none"> • Importance of HIE in promoting interoperability and continuity of care • Technical and policy considerations for successful HIE implementation • Case studies on successful HIE initiatives and their impact on care coordination <p>Clinical Decision Support Systems (CDSS) and Knowledge Management</p> <ul style="list-style-type: none"> • Role of CDSS in enhancing clinical decision-making • Knowledge management strategies for healthcare organizations • Case studies on effective use of CDSS and knowledge management tools <p>Quality of Care and Patient Safety</p> <ul style="list-style-type: none"> • How health IT influences quality improvement initiatives • Patient safety considerations in health IT implementation • Strategies for mitigating risks associated with health IT systems <p>Regulatory Issues and Compliance</p> <ul style="list-style-type: none"> • Overview of regulatory frameworks governing health IT (e.g., GDPR, FDA regulations) • Compliance requirements for healthcare organizations and technology vendors • Emerging trends in health IT regulation and their impact on industry practices <p>Systems Integration and Interoperability</p> <ul style="list-style-type: none"> • Importance of systems integration in healthcare IT infrastructure • Standards and protocols for achieving interoperability among healthcare systems • Case studies on successful systems integration projects and their outcomes 	10
10	<p>Emerging Trends and Innovations in Health Informatics</p> <p>Big Data and Predictive Analytics</p> <ul style="list-style-type: none"> • Definition and importance of big data in healthcare • Applications of predictive analytics in clinical decision-making and population health management • Ethical considerations and challenges in using big data for healthcare purposes <p>Consumerism and Technology in Healthcare</p> <ul style="list-style-type: none"> • Empowerment of patients through health IT tools (e.g., patient portals, wearable devices) • Impact of consumerism on healthcare delivery and patient engagement • Strategies for promoting patient-centered care through technology <p>Virtual Health and Telemedicine</p> <ul style="list-style-type: none"> • Definition and scope of virtual health and telemedicine • Technologies enabling remote patient monitoring and teleconsultations • Legal and regulatory considerations for virtual health services <p>Emerging Technologies in Health Informatics</p> <ul style="list-style-type: none"> • Exploration of cutting-edge technologies (e.g., artificial intelligence, blockchain) in healthcare • Potential applications and benefits of emerging technologies in health informatics 	6

	<ul style="list-style-type: none"> Ethical, legal, and social implications of adopting new technologies in healthcare 	
11	<p>Future Directions and Challenges in Health Informatics</p> <p>Trends Shaping the Future of Health Informatics</p> <ul style="list-style-type: none"> Predictions for the future of health IT and informatics Emerging trends in research and development within the field Potential challenges and opportunities for health informatics professionals <p>Case Studies and Practical Applications</p> <ul style="list-style-type: none"> Analysis of real-world case studies highlighting successful health IT implementations Practical applications of health informatics concepts in healthcare settings Group projects or presentations on innovative uses of health IT solutions <p>Ethical and Social Considerations</p> <ul style="list-style-type: none"> Ethical dilemmas in health informatics practice (e.g., privacy, data security) Social implications of health IT adoption and usage Strategies for addressing ethical challenges in health informatics 	5
Total		45 hrs

Bibliography:**Main Reference:**

1. Medical Informatics, e-Health: Fundamentals and Applications by Alain Venot, Anita Burgun, Catherine Quantin
2. Health Informatics: Multidisciplinary Approaches for Current and Future Professionals (HIMSS Book Series) by Salvatore Volpe (Editor)
3. Demystifying Big Data and Machine Learning for Healthcare by Prashant Natarajan, John C. Frenzel, Detlev H. Smaltz
4. Margaret A Skurka, Health Information Management
5. <https://library.ahima.org/PdfView?oid=105>

Additional Reference:

1. Edna K Huffman, Health Records Management
2. Health Information Technology, Marilyn Takahashi Fordney
3. Michelle A Green, Mary Jo Bowie, Essentials of Health Information Management – Principles and Practice
4. Fundamentals of Health Information Management 2nd Edition - Published by the Canadian Healthcare Association (CHA) in collaboration with the Canadian Health Information Management Association (CHIMA)

Name of the Program	M.Sc. Health Informatics
Semester	Semester I
Name of the Subject	Hospital Administration and Healthcare Financing
Subject Code	MHIMT 102 T

Learning Outcomes	<ul style="list-style-type: none"> • Understanding the basics of Healthcare management and Economics • To know the principles of organizational management in various healthcare settings • Understanding and evaluating healthcare finance and budgeting • To know the HR functions in a healthcare setting • To know how the administrators manages clinical and no clinical services • Understanding the various health insurance schemes and mechanism of financial protection • Understanding the Quality Assurance (QA) and how to improve it • Analyze the healthcare policies, regulations and ethical issues • Understanding about the planning and maintenance of hospital infrastructure and managing support services • Understanding hospital accounting
Course Outcomes	<ul style="list-style-type: none"> • Understand and apply healthcare management principles and policies. • Analyze the financial management strategies and budgeting within healthcare organizations. • Implement quality improvement and patient safety protocols. • Navigate health economics, healthcare finance, and insurance systems. • Develop skills in resource tracking, management, and financial auditing in the healthcare sector.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Healthcare Management and Economics <ul style="list-style-type: none"> • Definition and importance of management in healthcare • Key concepts in health economics: demand, supply, production, & market models • Principle of Management • Roles and functions of healthcare managers • Managerial skills and decision-making in healthcare • Basic requirement of IT infrastructure in Hospital • Health Information Management Systems (HIMS) requirements for hospitals and its components 	6
2	Organizational Management and Hospital Structures <ul style="list-style-type: none"> • Principles of organizational management in healthcare • Organizational culture, values, and mission • Hospital organizational structures: Government, private, and not-for-profit • Management theories and their application in hospital settings • Indicators in Hospital 	6
3	Healthcare Finance and Budgeting <ul style="list-style-type: none"> • Health financing functions and sources of revenue 	6

	<ul style="list-style-type: none"> Revenue collection and government financing of health services Financial management and budgeting within healthcare organizations Risk pooling, financial protection, and equality in health financing 	
4	Human Resource Management in Healthcare <ul style="list-style-type: none"> Overview of HR functions in healthcare settings Recruitment, training, & development of healthcare staff Leadership and team management in hospitals Legal issues and performance appraisal in healthcare HR 	6
5	Clinical and Non-Clinical Services Management <ul style="list-style-type: none"> Overview of clinical departments: OPD, in-patients, ICU, surgical, and emergency services Management of nursing services, pharmacy, diagnostics, and patient services The role of hospital administrators in managing clinical and non-clinical services 	6
6	Health Insurance and Financial Protection <ul style="list-style-type: none"> Concept and types of health insurance Government-funded health insurance schemes (e.g., PMJAY, Ayushman Bharat) Financial protection mechanisms through insurance The role of insurance in healthcare financing and accessibility 	6
7	Quality Assurance and Improvement in Healthcare <ul style="list-style-type: none"> Concepts and standards of quality care Quality improvement tools and methodologies Quality assessment: Utilization management, peer review, and risk management Compliance with international standards like ISO and NABH Use of AI in Hospital Administration and in Quality Management of Healthcare 	6
8	Healthcare Policies, Law, and Ethics <ul style="list-style-type: none"> Health law, regulations, and accreditation standards Role of IT infrastructure in Govt. policy making and healthcare data integration Ethical issues in healthcare, including patient autonomy, informed consent, and end-of-life care Medico-legal aspects in healthcare practice Compliance and auditing methods in healthcare 	6
9	Hospital Infrastructure and Support Services <ul style="list-style-type: none"> Planning and maintaining hospital infrastructure Managing support services: Laundry, catering, cleaning, CSSD, transport, & security Biomedical engineering and equipment maintenance in hospitals Corporate governance and relationships with external institutions 	6
10	Accounting, Audit, and Healthcare Statistics <ul style="list-style-type: none"> Accounting systems and audit procedures in healthcare Legal requirements for hospital financial reporting Hospital statistics: Analysis and reporting of hospital services and discharges Vital statistics: Collection, processing, & interpretation 	6
Total		60 hrs

Bibliography:

- Hospital Planning: Facilities Planning and Management by GD Kunders.
- Principles Of Hospital Administration And Planning by Sakharkar
- Hospital Administration and Human Resource Management by Sharma and Goyal
- Hospital and Healthcare Accreditation (As Per the Guidelines of NABH, NABL, JCI) by Brajkishore Rajoriya
- Quality Management in Hospitals by SK joshi

6. Standard Operating Procedures: For Hospital in India by Arun Agarwal
7. A Primer of Health System Economics-V.Raman Kutty
8. Guinness, Lorna, Wiseman, Virginia (2011), Introduction to Health Economics. McGraw-Hill Education (UK)
9. Dewar, D. M. (2011). Essentials of health economics. Jones and Bartlett Publishers.
10. Gottret, P. E., & Schieber, G. (2006). Health financing revisited: A Practitioner's Guide. World Bank Publications.

Name of the Program	M.Sc. Health Informatics
Semester	Semester I
Name of the Subject	Research Methodology & Biostatistics (Core Course)
Subject Code	CC 001 T

Learning Outcomes	<ul style="list-style-type: none"> The course is intended to give an overview of research and statistical models commonly used in medical and bio-medical sciences. The goal is to impart an intuitive, understanding and working knowledge of research designs and statistical analysis. The strategy would be to simplify, analyse the treatment of statistical inference and to focus primarily on how to specify and interpret the outcome of research.
Course Outcome	<ul style="list-style-type: none"> Student will be able to understand develop statistical models, research designs with the understating of background theory of various commonly used statistical techniques as well as analysis, interpretation & reporting of results and use of statistical software.

Sr. No	Topic	No. of Hrs.
A	Research Methodology:	23
1	Scientific Methods of Research: Definition of Research, Assumptions, Operations and Aims of Scientific Research. Research Process, Significance and Criteria of Good Research, Research Methods versus Methodology	4
2	Research Designs: Observational Studies: Descriptive, explanatory, and exploratory, Experimental Studies: Pre-test design, post-test design, Follow-up or longitudinal design, Cohort Studies, Case – Control Studies, Cross-sectional studies, Intervention studies.	5
3	Sampling Designs: Census and Sample Survey, Need and importance for Sampling, Implications of a Sample Design, Different Types of Sample Designs (Probability sampling and non-probability sampling), Systematic sampling, Stratified sampling, Cluster sampling, Multi-stage sampling, Sampling with probability proportional to size, Sequential sampling.	5
4	Measurement in research: Measurement Scales, Sources of Error in Measurement,	3
5	Methods of Data Collection: Types of data, Collection of Primary Data, Observation Method, Interview Method	4
6	Research Ethics and plagiarism	2
B	Biostatistics	22
7	Data Presentation: Types of numerical data: Nominal, Ordinal, Ranked, Discrete and continuous. Tables: Frequency distributions, Relative frequency, Graph: Bar charts, Histograms, Frequency polygons, scatter plots, line graphs	3
8	Measures of Central Tendency and Dispersion: Mean, Median, Mode, Range, Inter quartile range, variance and Standard Deviation, Coefficient of variation, grouped mean and grouped standard deviation (including merits and demerits).	3
9	Testing of Hypotheses: Definition, Basic Concepts, Procedure for Hypothesis Testing, power of test, Normal distribution, Parametric Tests including Z-test, t-test, and ANOVA	4
10	Chi-square Test: Chi-square as a Non-parametric Test, Applications.	

		2
11	Measures of Relationship: Correlation and Simple Regression Analysis	3
12	Non-parametric test: Sign test, Wilcoxon signed-Rank Test, Wilcoxon Rank Sum Test: Mann-Whitney U test, Kruskal Walli's test, Friedman's test, and Spearman Rank correlation test.	3
13	Vital Health Statistics: rate, crude rate, age specific rate, Measurement of fertility, Rate, Measures of mortality.	4
Total		45 hrs

CC 001 P–Research Methodology & Biostatistics

Sr. No.	Topics	No. of Hrs.
A	Research Methodology	
1	Research Article Presentation (Seminar)	5
B	Biostatistics	
2	Data Presentation	4
3	Measures of Central Tendency and Dispersion	6
4	Testing of Hypotheses	16
5	Chi-square Test	4
6	Measures of Relationship	6
7	Analysis of Variance	5
8	Non parametric or Distribution-free Tests	8
9	Computer Application Using Statistical Software including SPSS	6
Total		60 hrs

Reference Books:

1. Daniel WW. Biostatistics: A foundation for analysis in the health sciences. 10th ed. Wiley; 2013.
2. Gupta SC, Kapoor VK. Fundamentals of mathematical statistics. Sultan Chand & Sons; 2020 Sep.
3. Kothari CR, Garg G. Research methodology: Methods and techniques. 2019.
4. Mahajan BK. Methods in biostatistics for medical students and research workers. 7th ed. Jaypee Brothers Medical Publishers; 2010.
5. Murthy MN. Sampling theory and methods. Statistical Publishing Society; 1967.
6. Singh YK. Fundamental of research methodology and statistics. New Age International; 2006.

Resolution No. 3.5 of Academic Council (AC-51/2025):

Resolved to approve the submitted list of recommended books for M.Sc. Clinical Nutrition and the course on **Biostatistics and Research Methodology** [ANNEXURE-7].

Annexure-7 of AC-51/2025

Biostatistics & Research Methodology Books List

Subject	Book Name	Author
Biostatistics & Research Methodology	Biostatistics: A Foundation for Analysis in the Health Sciences (10th ed.)	Daniel WW.
	Biostatistical Analysis (5th ed.)	Zar JH.
	Research Methodology: Methods and Techniques	Kothari CR, Garg G.
	Methods in Biostatistics for Medical Students and Research Workers (7th ed.)	Mahajan BK.
	Sampling Theory and Methods	Murthy MN.
	Fundamentals of Research Methodology and Statistics	Singh YK.
	Fundamentals of Biostatistics (8th ed.)	Rosner B.
	An Introduction to Medical Statistics (4th ed.)	Bland M.

Name of the Program	M.Sc. Health Informatics
Semester	Semester I
Name of the Subject	Fundamentals of Computer Application (Experiential)
Subject Code	MHIMT 103 E

Learning Outcomes	<ul style="list-style-type: none"> • Understanding the fundamentals of computers • To the know word processing using MS Word • Understanding various functionalities of Excel • To know how to make presentation using MS PowerPoint • Understand the basics of DBMS • To know the various functionalities of Microsoft Access database • Understand the basics of computer network • Understand various advanced computing technologies
Course Outcomes	<ul style="list-style-type: none"> • Understand the basics of computer hardware and software, various windows accessories and the functioning of the control panel • Demonstrate Skill in essential Microsoft Office applications • Apply database management system concepts when designing the different database objects. • Demonstrate Skill in Using Computer Networks, network topologies and Devices. • Understanding about emerging computer technologies like Blockchain, Machine Learning.

Sr. No.	Topics	No of Hrs.
1	Fundamentals of Computer <ul style="list-style-type: none"> • What is a Computer? • Components of Computer System • Types of Computers • Generations of Computers • Basic Operations • Concept of Hardware and Software • Basics of Operating System • File and Directory Management • Concepts of Programming Languages • Introduction to Algorithms and Flowcharts 	25
2	Understanding Word Processing (MS Word) <ul style="list-style-type: none"> • Word Processing Basics • Text Creation and manipulation • Formatting the Text • Table Manipulation • Track and Accept/Reject Changes to a Document 	20
3	Using Spread Sheet (MS Excel) <ul style="list-style-type: none"> • Elements of Electronic Spread Sheet • Manipulation of Cells 	25

	<ul style="list-style-type: none"> • Insert data • Formulas and Function • Analysis of Data • Data Visualization 	
4	Making Presentation (MS PowerPoint) <ul style="list-style-type: none"> • Basics • Creation of Presentation • Preparation of Slides • Presentation of Slides • Slide Show 	25
5	Introduction to Database Management System <ul style="list-style-type: none"> • Introduction to databases (Definition, Importance, Applications) • Types of Databases • DBMS components • Data Models • SQL Basics • Compare the flat file with the relational database management system 	20
6	Microsoft Access <ul style="list-style-type: none"> • Introduction to MS Access • Filters, Forms, and Reports • Writing and modifying queries • Charts and Import Data • Introduction to SQL 	20
7	Network Infrastructure <ul style="list-style-type: none"> • Introduction to Networking • Types of Network • Network Topologies • Networking Devices • Internet Basics 	20
8	Emerging Technologies <ul style="list-style-type: none"> • Cloud Computing concepts and models • Internet of Things (IoT) • Blockchain Technology basics • Introduction to Artificial Intelligence and Machine Learning 	25
Total		180 hrs

Bibliography:

Main reference:

1. Easy Computer Basics- Michael Miller
2. Teach Yourself Basic Computer Skills - Moira Stephen
3. Mike McGrath, "Access in easy steps." 2019
4. Steven Roman, "Access Database Design & Programming", 1st edition
5. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy
6. "Introduction to Computing Systems: From Bits & Gates to C & Beyond" by Yale N. Patt and Sanjay J. Patel
7. "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
8. "Fundamentals of Database Systems" by Ramez Elmasri and Shamkant B. Navathe
9. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross

10. “Data Communications and Networking” by Behrouz A. Forouzan
11. “The Art of Computer Programming” by Donald E. Knuth

Additional reference:

1. Microsoft Office for Dummies-Wallace Wang
2. New Perspectives Microsoft Office 365 & Excel 2019 Comprehensive
3. Andrew Couch, “Microsoft Access 2013 Plain and Simple”
4. Joyce Cox, Joan Lambert, “Step by Step Microsoft Access 2013”
5. “Computer Science: An Overview” by J. Glenn Brookshear and Dennis Brylow

Name of the Program	M.Sc. Health Informatics
Semester	Semester I
Name of the Subject	Python Basics
Subject Code	MHIMT 104 P

Learning Outcomes	<ul style="list-style-type: none"> • Understanding the basics of python programming. • Understanding and using the list, ranges and tuples • Understanding and using the python dictionaries and sets • Understanding and using the input/ output functionalities of python • Understanding and using python functions • Understanding and using the concepts of Object-oriented programming • Understanding and using the python exception handling functionalities • Understanding and using the concept of regular expression in python
Course Outcomes	<ul style="list-style-type: none"> • Develop a solid understanding of Python's syntax and semantics, including data types, variables, operators, and basic control structures. • Demonstrate Competency in working with Python's core data structures, including lists, ranges, tuples, dictionaries, and sets. • Know how to handle input and output operations in Python, including reading from and writing to files, and interacting with user input in a robust manner. • Apply the principles of modular programming by defining and using functions, including the use of parameters, return values, and variable scope. • Acquire the ability to implement object-oriented programming concepts in Python, such as classes, objects, inheritance, and polymorphism, to create reusable and maintainable code. • Master the techniques for managing errors and exceptions in Python, ensuring that programs can handle unexpected situations gracefully and continue to operate correctly. • Explore the use of regular expressions in Python for pattern matching and text processing, gaining the ability to handle complex string manipulation tasks.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Python <ul style="list-style-type: none"> • What is Python & the history of Python? • Unique features of Python • Install Python and Environment Setup • First Python Program • Python Identifiers, Keywords & Indentation • Comments and document interlude in Python • Command line arguments • Getting User Input • Python Data Types • Python variables • Python Core objects and Functions 	15
2	List, Ranges & Tuples in Python	15

	<ul style="list-style-type: none"> • Introduction • Lists in Python • Understanding Iterators • Generators, Comprehensions & Lambda Expressions • Understanding and using Ranges • Ordered Sets with tuples 	
3	Python Dictionaries and Sets <ul style="list-style-type: none"> • Python Dictionaries • Sets & Python Sets Examples 	10
4	Input and Output in Python <ul style="list-style-type: none"> • Reading and writing text files • Writing Binary Files Manually • Using Pickle to Write Binary Files 	10
5	Python functions <ul style="list-style-type: none"> • Python user-defined functions • Python packages functions • Defining and calling Function • The anonymous Functions • Loops & statements in Python • Python Modules & Packages 	15
6	Python Object Oriented <ul style="list-style-type: none"> • Overview of OOP • Creating Classes and Objects • Accessing attributes • Built-In Class Attributes • Destroying Objects 	15
7	Python Exceptions Handling <ul style="list-style-type: none"> • What is an Exception? • Handling an exception • try....except...else • try-finally clause • Argument of an Exception • Python Standard Exceptions • Raising an exception • User-Defined Exceptions 	15
8	Python Regular Expressions <ul style="list-style-type: none"> • What are regular expressions? • The match Function • The search Function • Matching vs. searching • Search and Replace • Extended Regular Expressions • Wildcard 	15
Total		120 hrs.

Bibliography:

1. Core Python Programming, 3rd edition: Covers fundamentals to advanced topics like OOPS, Exceptions, Data structures, Files, Threads, Net by R. Nageswara Rao
2. Python: The Complete Reference by Martin C. Brown

FIRST YEAR

M.Sc. Health Informatics

SEMESTER- II

Code No.	Core Subjects
Discipline Specific Core Theory	
MHIMT 105 T	Advanced Health Informatics & HI Practicum
MHIMT 106 T	Clinical Workflow, Process Redesigning & Clinical Documentation Improvement (CDI)
MHIMT 107 T	Medical Language & International Classification of Disease Coding
MHIMT 108 T	Medical Transcription & Editing
Discipline Specific Core Practical / Experiential	
MHIMT 109 E	Advanced Health Informatics & HI Practicum
MHIMT 110 P	Medical Language & International Classification of Disease Coding
MHIMT 111 P	Medical Transcription & Editing
Discipline Specific Elective	
DSE 001 P	Web Development Basics (Optional 1)
DSE 002 P	Advanced Python (Optional 2)

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Advanced Health Informatics & HI Practicum (Theory + Experiential)
Subject Code	MHIMT 105 T & MHIMT 109 E

Learning Outcomes	<ul style="list-style-type: none"> • Understanding of various applications of Health Informatics • Understanding of the consumer health informatics applications and role of health informatics professionals in protecting the privacy and confidentiality of consumers • Understanding the concepts of Knowledge Base and Expert System • Understand how to protect health data legally and ways of information getting released from the hospital • Understanding the role of mHealth applications in healthcare and technologies/ platforms available to make robust mHealth solutions • Understanding the concept of cyber security threats and vulnerabilities in healthcare and its impact on data • Understanding the role of informatics in public health context • Understanding the role of informatics in disaster preparedness and planning • Understanding and analysis of future direction of Health informatics • Understanding the work culture within Medical Record department • Understanding the work culture within Quality department • Understanding the work flow of insurance and claims processing • Understanding the workflow of Registration and billing • Understanding the work culture within IT/HIS department • Understand how to process and do the analysis of healthcare data • Understanding the work culture within OPD, Emergency room, Radiology Dept. Labs and In-patient wards
Course Outcomes	<ul style="list-style-type: none"> • Understand the management of various advanced health informatics applications • Interpret the application of health informatics for managing patient data and supporting healthcare professionals in making a quality decision • Describe the content and features to be included in the informatics application to the application developer in making advance and expert informatics application • Identify the trends and emerging technology for informatics application in healthcare settings. • Recognize the future requirement using various approaches and prediction tools • Develop awareness, understanding and capacity in the specific roles and responsibilities of a health information management professional • Understand through an intensive experience the nature of hospitals and health care settings as workplaces and their associated values, routines and cultures • Develop skill and professional capacity for managing the health information system of a health care setting

	<ul style="list-style-type: none"> • Develop competency to plan, implement, and carry out a clinical audit in the quality assurance cell • Demonstrate competency to plan, implement, and carry out a claims processing in the health insurance department
--	--

Sr. No.	Topics	No. of Hrs.
1	Applications of Health Informatics <ul style="list-style-type: none"> • Features and functionality of the administrative, clinical, and nursing modules of the hospital information system • EHR adoption model • Strategies for implementing various electronic health records for the management of patient clinical data • Analyze the global scenario of telemedicine in providing healthcare to the outreach community • Barriers in implementing telemedicine in Indian Scenario • Understanding eHealth market segments using examples and case studies • Benefits and current trends of eHealth Applications • Role of health informatics professionals in implementing eHealth applications and Telemedicine 	5
2	Consumer Health Informatics <ul style="list-style-type: none"> • Role of informatics application in the empowerment of healthcare consumers • Methodology used for the assessment of validity and reliability of online health information • Role of health informatics professionals in protecting the privacy and confidentiality of consumer health information 	5
3	Knowledge Base and Expert System <ul style="list-style-type: none"> • Classification and comparison of the various Knowledge-Based Expert Systems, highlighting the features and functionality • Rationale for a knowledge-based expert system in healthcare • Functions of a clinical decision support system • Advantages and disadvantages of clinical decision support system • Role of Artificial Intelligence (AI) in managing patient data 	5
4	Protection of Healthcare Information <ul style="list-style-type: none"> • Legal implication in implementing informatics application in healthcare • Various methodologies for legally protecting the health information maintained in an automated system • Ways in which information is getting released from a hospital to various stakeholders • Role of HIPPA in releasing and protecting patient data • Analysis of various reengineering processes a hospital should comply with in protecting the patient data • Role of a Health Information Management Professional in protecting patient data 	5
5	mHealth Applications in Healthcare <ul style="list-style-type: none"> • Introduction to mHealth <ul style="list-style-type: none"> • Definition and scope of mHealth • Historical evolution of mHealth • Benefits and challenges of mHealth applications • mHealth Technologies and Platforms <ul style="list-style-type: none"> • Overview of mobile devices and platforms 	5

	<ul style="list-style-type: none"> • Sensors and wearables in mHealth • Mobile applications and software development kits (SDKs) • Integration with electronic health records (EHRs) • Design and Development of mHealth Applications <ul style="list-style-type: none"> • User-centered design principles • Usability and accessibility in mHealth apps • Prototyping and development tools • Testing and evaluation methods • Implementation and Evaluation of mHealth interventions <ul style="list-style-type: none"> • Implementation strategies and frameworks • Monitoring and evaluation metrics • Data collection and analysis methods 	
6	<p>Cyber security in Healthcare</p> <ul style="list-style-type: none"> • Introduction to Healthcare Cyber security <ul style="list-style-type: none"> • Overview of cyber security in healthcare • Common cyber security threats and vulnerabilities • Impact of cyber-attacks on healthcare organizations • Regulatory and compliance requirements (HIPAA, GDPR) • Risk Management and Mitigation Strategies <ul style="list-style-type: none"> • Risk assessment methodologies • Developing a risk management plan • Incident response and disaster recovery • Best practices for mitigating cyber security risks • Emerging Trends and Future Directions in Healthcare Cyber security <ul style="list-style-type: none"> • Artificial Intelligence (AI) and Machine Learning (ML) in cyber security • Blockchain technology for securing health data management • Future challenges and opportunities 	5
7	<p>Informatics in Public Health Practice</p> <ul style="list-style-type: none"> • Introduction to public health informatics <ul style="list-style-type: none"> • Definition and significance of public health informatics • Historical development and evolution of the field • Key theories and models in public health informatics • Health Information Systems for Public Health <ul style="list-style-type: none"> • Design and implementation of public health information systems • Integration of public health and clinical data • Geographic Information Systems (GIS) in Public Health <ul style="list-style-type: none"> • Applications of GIS in public health research and practice • Mapping and spatial analysis of health data 	5
8	<p>Informatics in Emergency Preparedness and Response</p> <ul style="list-style-type: none"> • Disaster Preparedness and Informatics <ul style="list-style-type: none"> • Informatics tools for disaster preparedness and planning • Case studies of informatics in disaster response • Real-time Data Systems in Emergencies <ul style="list-style-type: none"> • Real-time data collection and analysis during public health emergencies • Role of informatics in emergency decision-making • Communication and Coordination 	5

	<ul style="list-style-type: none"> • Informatics solutions for improving communication and coordination during emergencies • Use of social media and digital platforms in emergency response 	
9	Future Direction of Healthcare Informatics <ul style="list-style-type: none"> • Trends used in predicting the development of healthcare informatics • Reasons and types of future study for predicting the growth and impact of health informatics application 	5
HI Practicum		
10	Medical Records Department <ul style="list-style-type: none"> • To carry out diagnostic coding of the files in the department • Evaluate the accuracy of diagnostic and procedural coding • Analysis of statistical data for decision making as per the requirement. • Implement provider querying techniques to resolve coding discrepancies • Verify, analyze and validate the accuracy and completeness of health records data. • To know the process of transition from paper to electronic health records 	135
11	Quality Management Department <ul style="list-style-type: none"> • Use quality management tools to analyze data. • Conduct quality assessments, including data and process quality. • Understand coding audits. • Understand how to ensure data quality meets organizational standards. • Understand internal and external data quality guidelines. • Understand how to monitor and detect fraud or misuse of data. 	
12	Insurance and Claims Processing Integrated PMJAY & MJPJAY: <ul style="list-style-type: none"> • Learning of log-in in the portal • Pre authorization module: Method of raising the pre-authorization along with ICD 11 and International Classification of Health Interventions (ICHI) codes, Clinical Protocols module. • Claim module: Learning the process of claims uploading and appeals. • Access of Grievance module. • Access of Health camps modules Mediclaim: <ul style="list-style-type: none"> • Manage the use of clinical data required by various payment and reimbursement systems • Take part in selection and processes for insurance claims management • Apply information operability and information exchange with other sections of the enterprise 	
13	Registration and Billing <ul style="list-style-type: none"> • Communicate with patients about details on patient-centered health information • Assist in the processes for revenue cycle management and reporting 	
14	Information Technology (IT) / Hospital Information System (HIS) Department <ul style="list-style-type: none"> • Understand the need for Health IT in healthcare settings. • Assess end users' information needs. • Identify the required software and IT solutions. • Ensure IT solutions meet technical standards. • Conduct training for end users on IT systems. • Assist in IT system implementation. • Develop tools to assess user satisfaction. • Establish a system for regular audits and user feedback. 	
15	OPD, Emergency room, Radiology Dept., Labs, In-patient wards, Pharmacy, Operation Theatre, Intensive Care Unit, Clinical nutrition	

<p>Understanding Clinical Workflow, Inventory Management, and Medical Records:</p> <ol style="list-style-type: none"> 1. Learn how different hospital departments (OPD, Emergency, Radiology, Labs, Wards, Pharmacy, OT, ICU, and Clinical Nutrition) function. 2. Understand how inventory (medicines, equipment, and supplies) is managed in each unit. 3. Learn how patient records are documented and maintained in each department. <p>Understanding Health IT Systems (EMR, PACS, LIS, RIS, etc.):</p> <ol style="list-style-type: none"> 1. Learn how Electronic Medical Records (EMR) improve patient data management. 2. Understand how PACS helps store and share radiology images. 3. Explore how LIS and RIS support lab and radiology services. 4. Get familiar with other health IT tools used to improve patient care and hospital operations. 	
Total	180 hrs

Bibliography:**Main Reference:**

1. Michelle A Green, Mary Jo Bowie Essentials of Health Information Management – Principles and Practice. Thomson Delmer Learning
2. Englehardt & Nelson, Healthcare Informatics- An interdisciplinary Approach
3. Marison J Ball, Morris F Collen, Aspects of the Computer Based Patient Record. Springer-Verlag
4. Mohan Bansal. Medical Informatics: A Primer. TMH 2003.

Additional Reference:

1. Paul Taylor. From Patient data to medical knowledge: The principles and Practice of Health Informatics. Blackwell Publication
2. Sue Whetton. Health Informatics – A socio technical Perspective. Oxford University Press
3. Susan H, Sue Biedermann. Introduction to Health Informatics. AHIMA
4. "mHealth: New horizons for health through mobile technologies" - World Health Organization
5. "The impact of mobile health interventions on chronic disease outcomes in developing countries" - Journal of Telemedicine and Telecare
6. "Mobile Health (mHealth) Technologies and Applications" - Health Information Science and Systems
7. "Integration of Mobile Health Applications in Health Information Systems: Challenges and Solutions" - Journal of Medical Internet Research
8. "User-Centered Design of mHealth Apps: Perspectives from Healthcare Professionals and Patients" - JMIR mHealth and uHealth
9. "Evaluating Mobile Health Applications: Enhancing the Quality and Impact of mHealth Solutions" - Journal of Biomedical Informatics
10. "Implementing mHealth Interventions: Successes, Challenges, and Lessons Learned" - Global Health Action
11. "Cyber security in Healthcare: A Comprehensive Review of Threats and Solutions" - Health Services Management Research
12. "Understanding the Cyber security Threat Landscape in Healthcare" - Healthcare Informatics Research
13. "Risk Management in Healthcare Cyber security: A Guide for Healthcare Organizations" - Journal of Healthcare Risk Management
14. "Mitigating Cyber security Risks in Healthcare: Strategies and Solutions" - Journal of Cyber security
15. "The Role of Artificial Intelligence in Healthcare Cyber security" - Journal of Artificial Intelligence Research
16. "Blockchain for Health Data and Its Potential Use in Health IT and Health Care Related Research" - ONC Report

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Clinical Workflow, Process Redesigning & Clinical Documentation Improvement (CDI)
Subject Code	MHIMT 106 T

Learning Outcomes	<ul style="list-style-type: none"> • Understand the basics of clinical workflow and process redesign and its impact on healthcare delivery • Understand the workflow analysis methods and tools • Analyze the root causes of clinical workflow problems • Understand the impact of change within a healthcare organization • Understand the role of technology in clinical workflow optimization • Design an action plan for clinical process redesign • Understand the Lean and Six Sigma tools for process improvement • Understand the CDI program • Understand the main focus areas of CDI specialist and required competencies • Understand the general process of CDI • Understand the implication of CDI in an inpatient setting • Understand the association between CDI and PSI • Understand the implication of CDI in an outpatient setting • Understand the different types of CDI metrics
Course Outcomes	<ul style="list-style-type: none"> • Understand the concepts and importance of clinical workflow and process redesign, including the role of Clinical Documentation Improvement (CDI) programs and CDI specialists. • Identify focus areas for medical documentation improvements and the benefits of CDI programs. • Apply workflow analysis techniques to evaluate and document clinical processes, creating process maps to visualize workflows. • Identify bottlenecks, inefficiencies, and areas for improvement in clinical processes, and apply knowledge of CDI metrics to measure improvement outcomes. • Develop & Implement a plan for clinical process redesign, incorporating change management strategies to facilitate workflow optimization. • Apply various processes of a CDI program in both inpatient and outpatient settings, leveraging technology to enhance clinical workflow. • Evaluate the role of technology in clinical workflow enhancement and apply CDI principles to improve documentation practices and quality metrics.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Clinical Workflow and Process Redesign <ul style="list-style-type: none"> • Overview of clinical workflow and its impact on healthcare delivery • Principles of process improvement and redesign 	3

	<ul style="list-style-type: none"> • Ethical considerations in workflow redesign 	
2	Workflow Analysis Techniques <ul style="list-style-type: none"> • Workflow analysis methods and tools • Process mapping and value stream mapping • Time-motion studies and observation techniques • Data collection and analysis for workflow assessment 	4
3	Identifying Inefficiencies and Bottlenecks <ul style="list-style-type: none"> • Identifying common bottlenecks and inefficiencies in clinical workflows • Analyzing root causes of workflow problems • Human factors and ergonomics in workflow redesign 	3
4	Change Management in Workflow Redesign <ul style="list-style-type: none"> • Understanding change management principles and frameworks • Strategies for engaging stakeholders and managing resistance to change • Communication and training in workflow redesign initiatives 	3
5	Technology and Workflow Optimization <ul style="list-style-type: none"> • Role of technology in clinical workflow optimization • Electronic health records (EHR) and clinical decision support systems • Mobile health technologies and their impact on workflow • Integration of technology with clinical processes 	3
6	Implementation of Workflow Redesign <ul style="list-style-type: none"> • Developing an action plan for clinical process redesign • Pilot testing and evaluation of redesigned workflows • Monitoring and sustaining workflow improvements • Measuring outcomes and evaluating the impact of redesign efforts 	4
7	Lean and Six Sigma Methodologies <ul style="list-style-type: none"> • Introduction to Lean and Six Sigma principles • DMAIC (Define, Measure, Analyze, Improve, Control) framework • Applying Lean and Six Sigma tools for process improvement 	4
8	Introduction to Clinical Documentation Improvement (CDI) <ul style="list-style-type: none"> • Define a CDI program • Main requirements of CDI • CDI Program outcomes • Outline the impact of CDI and the role of a CDI specialist 	3
9	Focus areas of a CDI specialist <ul style="list-style-type: none"> • Nine focus areas of a CDI program • Important aspects of each focus areas: Laterality, Disease pathophysiology, Combination codes, Encounter timing, Identification of trimester, disease specificity, alcohol and drug abuse, expansion of injury codes and post-procedural disorders • Competency required for CDI specialist 	3
10	CDI program general process <ul style="list-style-type: none"> • CDI program general process: Assessment, Implementation, Maintenance, track results • Medical record Audit areas in CDI 	3
11	CDI in an Inpatient setting <ul style="list-style-type: none"> • Overview of glossary terms • Overview about DRGs and CMI • Overview about Comorbidities and complications • Overview about severity of illness and Risk of mortality • CDI responsibilities 	3
12	CDI and Patient Safety indicators <ul style="list-style-type: none"> • Overview of patient safety indicator (PSI) module 	3

	<ul style="list-style-type: none"> • Demonstrate the applications of patient safety and adverse event composite • Association of CDI and PSI 	
13	CDI in an outpatient (OP) setting <ul style="list-style-type: none"> • Overview of outpatient CDI • Relevance and benefits of OP CDI • Different aspects of HCC coding and risk adjustment factor • CDI for an emergency department 	3
14	CDI Metrics <ul style="list-style-type: none"> • Introduction on CDI metrics • Different types of CDI metrics • CDI Metrics for success • Common key performance of CDI metrics 	3
Total		45 hrs

Bibliography:**Main Reference:**

1. Clinical Informatics Study Guide by John T. Finnell, Brian E. Dixon (Chapter – 10)
2. Cognitive Informatics: Reengineering Clinical Workflow for Safer and More Efficient Care by Kai Zheng, Johanna Westbrook, Thomas G. Kannampallil, Vimla L. Patel
3. Clinical Documentation Improvement, Principle and Practice. Pamela Carroll Hess, MA, RHIA, CCS, CDIP, CPC, AHIMA Press, ISBN 978-1-58426-502-3.
4. Clinical Documentation Improvement Toolkit, AHIMA Product No.: ONB201016, ISBN: 9781584265382

Additional Reference:

1. The Essential CDI Guide to Provider Queries. Marian Kruse, Jennifer Cavagnac. Acdis product: ISBN-13: 978-1683080848
2. Bridging the Gap between Coding and Clinical Documentation Improvement (CDI). Anneleah W Bridges. Kindle edition.

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Medical Language & International Classification of Disease Coding (Theory + Practical)
Subject Code	MHIMT 107 T & MHIMT 110 P

Learning Outcomes	<ul style="list-style-type: none"> • To understand the origin and use of medical language • To understand the anatomy of a medical term • To understand the meanings of stem words from various body systems • To understand the meanings of prefixes from various body systems • To understand the meanings of suffixes from various body systems • To understand the meanings of various surgical terminologies • To understand the various medical abbreviations in use • To understand the common signs symptoms and common medical terms in use • To understand various disease conditions body system-wise • To understand syndromes, STDs, Neoplasms • To understand the concept of medical coding • To understand the concept and code using disease coding manuals • To understand the concept and code using procedure coding manuals
Course Outcomes	<ul style="list-style-type: none"> • Describe medical terminologies and their components, including stem words/root, prefixes, and suffixes. • Explain the concepts of body systems and identify the terminologies related to body systems, diseases, diagnostic, therapeutic tests, and procedures. • Enumerate surgical procedures, diseases, disorders, and dysfunctions. • Develop an understanding of medical abbreviations, signs and symptoms and common medical terms. • Apply the principles of medical coding using various coding systems. • Explain how the disease classification system integrates with health information systems and supports healthcare data management.

Sr. No.	Topics	No. of Hrs.
1	Introduction <ul style="list-style-type: none"> • Origin of medical terms historical perspective • Various uses and applications of medical terms • Purpose of learning medical terminology • Components of Medical Terms Stem words, Prefixes, Suffixes & combining vowels 	2
2	Stem Words/Root <ul style="list-style-type: none"> • Musculo-skeletal system • Respiratory system • Cardiovascular system • Digestive system 	5

	<ul style="list-style-type: none"> • Endocrine system • CNS system • Urinary system • Reproductive system • Organs of special sense • Integumentary system 	
3	<p>Prefix, Suffix</p> <p><i>Prefixes</i></p> <ul style="list-style-type: none"> • Definition, Various Prefixes, meanings and example terms • Pseudo Prefixes – meaning & Example terms <p><i>Suffixes</i></p> <ul style="list-style-type: none"> • Definition & Types of suffixes • Various Suffixes, meaning, and example terms 	8
4	<p>Surgical Terminologies</p> <ul style="list-style-type: none"> • Various surgical terminologies- system-wise <ul style="list-style-type: none"> ▪ Musculoskeletal system ▪ Respiratory system ▪ Cardiovascular system ▪ Digestive system ▪ Endocrine system ▪ CNS ▪ Urinary System ▪ Reproductive System ▪ Special Senses • Surgical positions & sutures 	4
5	<p>Medical Abbreviations</p> <ul style="list-style-type: none"> • Common Medical abbreviations used in medical practice 	2
6	<p>Common Signs, Symptoms & Medical Terms</p> <ul style="list-style-type: none"> • The common signs and symptoms associated with various diseases • The common medical terms used to furnish additional information in healthcare 	4
7	<p>Disease Conditions – System-wise (explain the common diseases affecting the various body systems, along with their definitions, causes, signs and symptoms, mode of transmission, diagnosis, treatment/ management/ prevention)</p> <ul style="list-style-type: none"> • Musculoskeletal system diseases • Respiratory system diseases • Cardiovascular system diseases • Digestive system diseases • Endocrine system diseases • CNS diseases • Urinary System diseases • Reproductive System diseases • Organs of Special Senses diseases 	18
8	<p>Syndromes, STDs & Neoplasms</p> <ul style="list-style-type: none"> • Common Syndromes • Common sexually transmitted Diseases • Neoplasms 	10
9	<p>Introduction to Medical coding and Nomenclature systems</p> <ol style="list-style-type: none"> 1. Understanding Medical coding and its applications. 2. Various Medical Nomenclature Systems <ol style="list-style-type: none"> i. SNDO ii. CMIT iii. SNOP 	2

	iv. SNOMED -CT v. CPT • Introduction to Disease and Surgical coding systems	
10	Disease Coding Systems 1. ICD 10 2. ICD 10-CM 3. ICD-11 4. ICD -O 5. ICF	25
11	Procedure Coding Systems 1. Current Procedural Terminology (CPT) 2. ICD-10 PCS 3. Healthcare Common Procedure Coding System (HCPCS)	25
Total		105 hrs

Bibliography:**Main Reference:**

1. Medical Terminology; A system Approach- Barbara. A. Gyls, Mary Ellen Wedding
2. Language of Medicine: A Write-in text Explaining Medical Terms - Chabner Davi-Ellen
3. Pathologic basis of Disease – Robins
4. The language of Medicine - Saunders Pub
5. Essential of Human Diseases and Conditions - Margaret Schell Frazier
6. ICD-10-CM 2024
7. <https://icd.who.int/browse/2024-01/mms/en#1435254666>

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Medical Transcribing & Editing (Theory + Practical)
Subject Code	MHIMT 108 T & MHIMT 111 P

Learning Outcomes	<ul style="list-style-type: none"> • Understand the basics of Health Information Transcribing • Understanding and apply the principles of Medical Transcribing • Understanding and application of Medical editing and Proofreading • Understanding the utilization of NLP and Transcription software • Understanding the Medical Transcription outsourcing market in India, government policies and regulations • Understand the Current/future trends and challenges in the Medical Transcription industry
Course Outcomes	<ul style="list-style-type: none"> • Understand medical report formats, transcription principles, editing and proofreading rules specific to medical content. • Develop skill and knowledge to accurately transcribe and edit health-related information • Demonstrate Skill in using natural language processing and other transcription software and applications in Medical Transcribing.

Sr. No.	Topics	No. of Hrs.
1	Health Information Transcribing <ul style="list-style-type: none"> • Overview of Health Information Transcribing, historical evolution, and significance in healthcare documentation • Growth of Medical Transcription industry over the years • Technological advancements that have influenced the growth of Medical Transcription 	5
2	Medical Transcription Principles <ul style="list-style-type: none"> • Listening skills and techniques for effective transcription • Typing proficiency and speed building exercises • Utilization of transcription equipment and software tools • Transcription conventions, formatting guidelines, and practice sessions on transcribing different types of medical reports 	25
3	Medical Editing & Proofreading <ul style="list-style-type: none"> • Importance of editing and proofreading in Medical Transcription • Common errors in Medical Transcription and strategies to avoid them • Grammar and punctuation rules specific to medical content, practice sessions on editing and proofreading medical reports • Edit and proofread a set of medical reports and provide feedback 	15
4	Utilizing Natural Language Processing & Transcription Software <ul style="list-style-type: none"> • Introduction to Natural Language Processing (NLP) and its applications in healthcare • Overview of popular transcription software and applications, hands-on training on using transcription software for efficiency and accuracy • Integration of NLP tools for automated transcription and editing, troubleshooting common issues with transcription software • Practice transcribing and editing using transcription software 	30
5	Outsourcing and Government Policies	10

	<ul style="list-style-type: none"> • Outsourcing of MT work: Pros & cons • Growth of Medical Transcription outsourcing industry globally • Overview of the Medical Transcription outsourcing market in India, government policies and regulations • Analyze a case study on compliance requirements and standards for Medical Transcription service providers 	
6	Industry Trends and Future Outlook <ul style="list-style-type: none"> • Current trends and challenges in the Medical Transcription industry • Emerging technologies and their impact on Medical Transcription • Career opportunities and pathways in Medical Transcription, future outlook and potential developments 	5
Total		90 hrs

Bibliography:

Main Reference:

1. Medical Transcription: Techniques, Technologies, and Editing Skills by Alice G. Ettinger and Blanche Ettinger
2. Medical Transcription: Techniques and Procedures by Marcy O. Diehl
3. The AAMT Book of Style for Medical Transcription" by American Association for Medical Transcription (AAMT)

Additional References

1. Online resources for medical terminology and anatomy
2. Transcription software manuals and tutorials
3. Journals and research articles on health information management and transcription

Discipline Specific Elective

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Web Development Basics (Practical)
Subject Code	DSE 001 P

Learning Outcomes	<ul style="list-style-type: none"> • Understand the web development basics • Understanding and application of HTML and CSS • Understanding the basic of JavaScript • Understanding and application of advanced JavaScript • Understanding and application of Version Control and Git • Understanding and application of Back-End Development Basics • Understanding and application of Full-Stack Development • Apply the concept of web development for Planning and Designing a Web Project
Course Outcomes	<ul style="list-style-type: none"> • Understand the fundamental concepts of web development. • Demonstrate skill in front-end and back-end web development. • Develop Skill to create responsive and dynamic websites.

Sr. No.	Topics	No. of Hrs.
1	<p>Introduction</p> <p>Overview of Web Development:</p> <ul style="list-style-type: none"> • Difference between front-end and back-end development • Roles and responsibilities of a web developer <p>How the Web Works:</p> <ul style="list-style-type: none"> • Understanding clients, servers, and browsers • HTTP/HTTPS protocols • DNS and domain names <p>Web Development Tools and Environments:</p> <ul style="list-style-type: none"> • Text editors (VS Code, Sublime Text) • Browsers and developer tools • Version control systems (Git) <p>Setting Up a Development Environment:</p> <ul style="list-style-type: none"> • Installing necessary software (Node.js, Git) • Basic command line usage 	4
2	<p>HTML and CSS</p> <p>HTML Basics:</p> <ul style="list-style-type: none"> • Structure of an HTML document • Common HTML elements (headings, paragraphs, links, images) • Attributes and their usage <p>Advanced HTML:</p> <ul style="list-style-type: none"> • Forms and form elements • Tables and their structure • Embedding multimedia (audio, video) <p>CSS Basics:</p> <ul style="list-style-type: none"> • CSS syntax and selectors • Styling text, colors, and backgrounds • Box model and layout 	10

	<p>Advanced CSS:</p> <ul style="list-style-type: none"> • Flexbox and Grid layout systems • Responsive design principles • CSS animations and transitions 	
3	<p>JavaScript Fundamentals</p> <p>Introduction to JavaScript:</p> <ul style="list-style-type: none"> • JavaScript syntax and basic constructs • Variables, data types, and operators <p>Control Structures:</p> <ul style="list-style-type: none"> • Conditional statements (if, else, switch) • Looping constructs (for, while, do-while) <p>Functions and Scope:</p> <ul style="list-style-type: none"> • Defining and invoking functions • Function scope and closures <p>DOM Manipulation:</p> <ul style="list-style-type: none"> • Selecting and modifying DOM elements • Event handling and listeners 	10
4	<p>Advanced JavaScript</p> <p>JavaScript Objects and Arrays:</p> <ul style="list-style-type: none"> • Creating and manipulating objects • Array methods and iteration <p>Asynchronous JavaScript:</p> <ul style="list-style-type: none"> • Understanding callbacks • Promises and async/await <p>JavaScript Frameworks:</p> <ul style="list-style-type: none"> • Introduction to React, Angular, or Vue.js • Building components and managing state <p>Building Interactive Web Applications:</p> <ul style="list-style-type: none"> • Form validation • Dynamic content updates 	10
5	<p>Version Control and Git</p> <p>Introduction to Version Control Systems:</p> <ul style="list-style-type: none"> • Importance of version control • Basic concepts (repository, commit, branch) <p>Basic Git Commands:</p> <ul style="list-style-type: none"> • Initializing a repository • Cloning, committing, pushing, and pulling <p>Branching and Merging:</p> <ul style="list-style-type: none"> • Creating and managing branches • Merging changes and resolving conflicts <p>Collaborating on Projects:</p> <ul style="list-style-type: none"> • Using GitHub for collaboration • Pull requests and code reviews 	6
6	<p>Back-End Development Basics</p> <p>Introduction to Server-Side Programming:</p> <ul style="list-style-type: none"> • Understanding server-side vs. client-side • Introduction to Node.js <p>Setting Up a Server:</p> <ul style="list-style-type: none"> • Installing and configuring Node.js • Creating a basic server <p>Working with Databases:</p> <ul style="list-style-type: none"> • Introduction to SQL and NoSQL databases • CRUD operations (Create, Read, Update, Delete) <p>RESTful APIs:</p>	10

	<ul style="list-style-type: none"> • Designing and implementing RESTful APIs • Handling requests and responses 	
7	<p>Full-Stack Development</p> <p>Integrating Front-End and Back-End:</p> <ul style="list-style-type: none"> • Connecting front-end with back-end services • Fetching and displaying data <p>Building a Simple Full-Stack Web Application:</p> <ul style="list-style-type: none"> • Project setup and structure • Implementing features and functionality • Testing and debugging <p>Web Security:</p> <ul style="list-style-type: none"> • Basic security principles • Authentication and authorization <p>Deployment:</p> <ul style="list-style-type: none"> • Hosting options (Heroku, Netlify) • Deploying web applications <p>Presenting the Project:</p> <ul style="list-style-type: none"> • Preparing a project presentation • Demonstrating features and functionality 	40
Total		90 hrs

Bibliography:

1. Duckett, J. (2011). HTML and CSS: Design and Build Websites. Wiley.
2. Duckett, J. (2014). JavaScript and JQuery: Interactive Front-End Web Development. Wiley.
3. Hartl, M. (2019). Ruby on Rails Tutorial: Learn Web Development with Rails. Addison-Wesley.
4. Version Control with Git, 3rd Edition by Prem Kumar Ponuthorai, Jon Loeliger
5. Node Cookbook: Discover solutions, techniques, and best practices for server-side web development with Node.js 14 by Bethany Griggs
6. The Road to React: The React.js with Hooks in JavaScript Book (2024 Edition) by Robin Wieruch (Author)
7. React Key Concepts: Consolidate your knowledge of React's core features 1st Edition, by Maximilian Schwarzmüller (Author)
8. <https://github.com/tDonker/REST-API-books>
9. Full Stack Web Development: The Comprehensive Guide (Grayscale Indian Edition) by Philip Ackermann (Author)
10. MASTERING HTML, CSS & Java Script Web Publishing by Laura Lemay , Rafe Colburn, Jennifer Kyrnin

Name of the Program	M.Sc. Health Informatics
Semester	Semester II
Name of the Subject	Advanced Python (Practical)
Subject Code	DSE 002 P

Learning Outcomes	<ul style="list-style-type: none"> • Understand how to set up the python environment • Understand the concept of multithreaded programming in Python • Understand the database connectivity in Python • Understanding about the various python packages required for Data analysis
Course Outcomes	<ul style="list-style-type: none"> • Understanding the core principles and exploring advanced features and libraries of Python. • Develop ability to implement multithreaded programs in Python, intricacies of concurrent execution and thread management to improve application performance. • Demonstrate Skill in using Python for database interactions, including connecting to databases, executing queries, and managing data using libraries such as SQLite, MySQL, and Postgre SQL. • Utilize Python for data analysis tasks, including data manipulation, statistical analysis, and visualization using libraries such as NumPy, pandas, and Matplotlib.

Sr. No.	Topics	No. of Hrs.
1	Setting Python Environment <ul style="list-style-type: none"> • Install Python and Environment Setup • Introduction to Integrated development (IDE) environment • Jupyter Notebook 	10
2	Python Multithreaded Programming <ul style="list-style-type: none"> • What is multithreading? • Starting a New Thread • The Threading Module • Synchronizing Threads • Multithreaded Priority Queue • Python Spreadsheet Interfaces • Python XML interface • Python JSON interface 	25
3	Using Databases in Python <ul style="list-style-type: none"> • Python MySQL Database Access • Install the MySQLdb and other Packages • Create Database Connection • CREATE, INSERT, READ, UPDATE and DELETE Operation • DML and DDL Operation with Databases • Performing Transactions • Handling Database Errors • Web Scraping in Python 	30
4	Python for Data Analysis <ul style="list-style-type: none"> • Numpy: <ul style="list-style-type: none"> • Introduction to numpy • Creating arrays 	40

<ul style="list-style-type: none"> • Using arrays and Scalars • Indexing Arrays • Array Transposition • Universal Array Function • Array Processing • Array Input and Output • Pandas: <ul style="list-style-type: none"> • What is pandas & where it is used? • Series in pandas • Index objects • Reindex • Drop Entry • Selecting Entries • Data Alignment • Rank and Sort • Summary Statics • Missing Data • Index Hierarchy • Matplotlib: <ul style="list-style-type: none"> • Introduction to Matplotlib • Figures and subplots • Colors, Markers & Line styles • Ticks, Labels & Legends • Saving plots to files • Data Loading, Storage, and File Formats <ul style="list-style-type: none"> • Reading and Writing Data in Text Format • Binary Data Formats • Interacting with Web APIs • Data Cleaning and Preparation <ul style="list-style-type: none"> • Handling missing data • Data Transformation • String manipulation • Data Wrangling: Join, Combine & Reshape • Exploratory Data Analysis (EDA) 	
Total	90 hrs

Bibliography:**Main Reference:**

1. Core Python Programming, 3ed: Covers fundamentals to advanced topics like OOPS, Exceptions, Data structures, Files, Threads, Net by R. Nageswara Rao
2. Python: The Complete Reference by Martin C. Brown
3. Django for Beginners by William S. Vincent
4. Two Scoops of Django 3.x by Daniel and Audrey
5. Django Design Patterns and Best Practices by Arun Ravindran

Additional Reference:

1. <https://docs.djangoproject.com/en/4.0/intro/tutorial01/>
2. <https://tutorial.djangogirls.org/en/>

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		Marks distribution	Marks allotted per section	Marks
Sec: A	VSAQ	5/6 x 2 M = 10	10	10
Sec: B	SAQ	3/4 x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4 x 5 M = 15	15	35
Sec: C	LAQ	2/3 x 10 M = 10	20	
Total				80 Marks

Marks Scheme for the University Examination (50 Marks)

Final theory marks will be 50 marks University Theory exam.

Question	Question No.	Question Type	Marks Distribution	Marks
Sec: A	1.	LAQ (2 out of 3)	2 X 10 Marks = 20	20
Sec: B	2.	SAQ (6 out of 8)	6 X 05 Marks = 30	30
Total				50 Marks

Practical exam pattern: Total 40 marks with following breakup

Exercise	Description	Marks
Q No (1-4)	Implementation (Code functionality structure and readability etc.)	4x5=20 M
Q No 5	Conceptual Understanding (Fundamental Principles and application knowledge etc.)	1x5=05 M
Q No 6	Problem Solving Skills (Logical thinking, debugging and troubleshooting etc.)	1x5=05 M
Q No 7	Documentation and Presentation / VIVA (Code documentation and explanation)	10 M
Total		40 Marks

Practical exam pattern Research Methodology & Biostatistics (Core course)**Total 50-mark distribution:**

Exercise	Description	Marks
Q No 1	Practical/Problem-Solving: These questions can assess statistical analysis, research design, hypothesis testing, or interpretation of data etc	2 × 10 marks each) = 20 marks
Q No 2	Identification of study designs, Critical appraisal of research papers, Application of biostatistical tools, Sampling techniques etc	(4 × 5 marks each) = 20 marks
Q No 3	Viva Voce (Oral Examination) Assessing conceptual clarity, application of research methodology, and statistical reasoning.	10 marks
Total		50 Marks

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	20 Marks

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
Total	20 Marks

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Checklist for Evaluation of Fundamentals of Computer Applications (MHIMT 103 E)

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the Internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Core Competencies	Marks allotted	Marks obtained
	Students will gain a foundational understanding of computer hardware, software, and key Windows accessories, including the control panel. They will become proficient in Microsoft Office applications, such as document formatting in Word, worksheet management & data analysis in Excel, and creating multimedia-rich presentations in PowerPoint. Students will also learn the basics of database management systems and their application in designing database objects. Additionally, they will be introduced to computer networks, network topologies, and devices, while gaining insights into emerging technologies like Blockchain and Machine Learning.	
Section A: Fundamentals of Computer Applications		
Ability to recall definitions, concepts, and computer basics (VIVA)	10	
Section B: MS Word		
Structure, alignment, and professional presentation (Document creation and layout)	3	
Application of font styles, paragraph alignment, and bulleting (Formatting (text, paragraphs, etc.)	3	
Accurate use of tables, charts, and other tools (Advanced features (tables/charts)	4	
Section C: MS Excel		
Accuracy and clarity in organizing data and applying basic formatting (Data entry and formatting)	3	
Correct implementation of formulas/functions (Formula usage)	3	
Accurate chart generation and meaningful visualization of data (Chart creation and interpretation)	4	
Section D: MS PowerPoint		
Logical flow, organization of content, and relevance of information (Slide structure and content)	3	
Application of appropriate animations and transitions (Use of animations and transitions)	3	
Effective use of images, charts, and other multimedia elements (Multimedia integration)	4	
Section E: DBMS (MS Access		
Proper structure, data types, and relationships between tables (Database design and table creation)	3	
Accuracy and efficiency of queries to retrieve relevant data (Query creation)	3	
Professional layout, clarity, and inclusion of relevant data in the report (Report generation)	4	
Total	50 Marks	

Sign of Internal Examiner: _____

Sign of External Examiner: _____

Common Checklist for Evaluation of Experiential Learning Semester II- Onwards (M.Sc. Health Informatics)

Name of the student: _____ Date: _____

Program: _____

Semester: _____ Name of the Internal faculty/Observer: _____

Name of the External Faculty/Observer: _____

Core Competencies	Marks allotted	Marks obtained
	Students will gain an understanding of the development and management of advanced health informatics applications. They will be able to interpret how health informatics supports patient data management and aids healthcare professionals in decision-making. Students will also identify emerging trends and technologies in healthcare informatics, describe essential features for developers, and recognize future needs using various prediction tools. They will be aware about the roles and responsibilities of health information management professionals and provide an in-depth understanding of the values, routines, and cultures of healthcare settings.	
Application of Knowledge		
Assessment Method -Case study analysis, System Evaluation, Project Proposal Description - Assess problem-solving ability, application of theories in real-world scenarios, and innovative solutions.	20	
Problem Solving skills		
Assessment Method -Case study analysis, System Evaluation, Project Proposal Description - Test students' ability to perform tasks or implement concepts practically.	15	
Reflection and critical thinking		
Assessment Method -Case study analysis, Project Proposal Description - Evaluate reflective responses, insights from experiences, and evidence of self-awareness and growth.	10	
Engagement and Participation		
Assessment Method - System Evaluation Description - Measure participation, enthusiasm, and collaboration during experiential activities.	05	
Total	50 Marks	

Sign of Internal Examiner: _____

Sign of External Examiner: _____



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.: 022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

Department of Health Informatics

Logbook for Semester II

MASTER IN HEALTH INFORMATICS

STUDENT NAME: _____

PRN NUMBER: _____

BATCH: _____

SEMESTER: _____

PERIOD FROM: _____ **TO** _____

COORDINATOR

HOD

DIRECTOR

Note:

1. A total of 225 hrs. posting to the various departments of the hospital must be completed within 15 weeks (during the semester)
2. Activities carried out by the student during the posting along with the day, date and Dept. Name must be clearly mentioned.
3. Signature of the Dept. In Charge must be collected on a weekly basis.
4. Before final submission the logbook must be duly signed by the Coordinator, HoD and Director SBSMGM.

STUDENT'S DAILY LOG

Day/Date/Time (Clearly Mention the above)	Activity carried out		Department In-charge Signature
	Activity details	Department Name	

Resolution No. 5.1 of Academic Council (AC-52/2025):

Resolved to approve the CBCS syllabus, including Program Outcomes (POs) and Course Outcomes (COs), for Postgraduate (PG) 2-year programs under MGMSBS (semester III & IV) for M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Clinical Embryology, M.Sc. Clinical Nutrition, M.Sc. Medical Dialysis Technology, M.Sc. Molecular Biology, M.Sc. Medical Radiology & Imaging Technology, M.Sc. Cardiac Care Technology, M.Sc. Operation Theatre and Anaesthesia Technology, M.Sc. Emergency and Trauma Care, M. Optometry, Masters in Hospital Administration, Masters of Public Health, M.Sc. Health Informatics, M.Sc. Medical Laboratory Technology, M.Sc. Clinical Research, to be effective from batch admitted in the Academic Year 2025-26 onwards. Guidelines for selected programmes as per National Commission for Allied & Healthcare Professions will be adopted for the given programmes from academic year 2026-27 onwards [ANNEXURE-17A, 17B, 17C, 17D, 17E, 17F, 17G, 17H, 17I, 17J, 17K, 17L, 17M, 17N, 17O & 17P and ANNEXURE-18A, 18B, 18C, 18D, 18E, 18F, 18G, 18H, 18I, 18J, 18K, 18L, 18M, 18N, 18O & 18P].



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A++" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel. No.:022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/Website: www.mgmsbsnm.edu.in

CHOICE BASED CREDIT SYSTEM (CBCS)

(Academic Year 2025 - 26)

Curriculum for

M.Sc. Allied Health Sciences

M.Sc. Health Informatics

Semester III & IV

Semester III

MHIMT 112 T	Entrepreneurship and Health IT Project Management	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Analyze the process of innovation and new idea generation and explain the business environment to identify business opportunities.	PO1, PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Evaluate and apply different entrepreneurial strategies and assess the new venture feasibility and risk evaluation.	PO1, PO8	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Explain project management process, lifecycle and its organization.	PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO4	Explain the monitoring, evaluation and control process involve in the project management.	PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MHIMT 113 T	Managing Health Information Systems	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Plan, Monitor, organization and control the health Information system and its resources required for managing patient data.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Demonstrate the leadership role in healthcare IT projects and related activities.	PO3, PO6, PO5	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Analyze the Benefits, Cultural Challenges, and issues in adopting health information system and application.	PO1	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO4	Demonstrate the application of knowledge management system in healthcare organization.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO5	Develop various QA approach in implementing and managing health information system	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO6	Apply the concept of Information Governance in managing healthcare and healthcare data management.	PO1, PO3	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MHIMT 114	Research Project / Dissertation	Mapped POs	Teaching-Learning Methodologies	Assessment Tools

CO1	Develop healthcare informatics solutions that align with industry standards and regulatory requirements.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
CO2	Evaluate healthcare challenges and design innovative IT-based interventions.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
CO3	Implement secure and interoperable health information systems using industry frameworks.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
CO4	Demonstrate project management skills to plan, execute, and optimize healthcare IT projects.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
CO5	Collaborate effectively with multidisciplinary teams to integrate healthcare and IT expertise.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
CO6	Assess system performance through testing and optimization to improve cybersecurity and efficiency.	PO1, PO8	Guidance & supervision along with documentation & reporting	Internal Exam (Seminar Presentation)
MHIMT 115 P	Database Management System	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the core principles of database management systems, including data modeling, database architecture, and normalization techniques.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Develop proficiency in using Structured Query Language (SQL) for data definition, manipulation, and querying within MySQL.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Learn to design and implement databases that are efficient, scalable, and secure, applying best practices in data modeling and normalization.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO4	Apply theoretical knowledge through practical lab sessions and projects, developing real-world databases and solving complex data management problems.	PO4	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
MHIMT 116 P	Advanced Web Development	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understanding of advanced web development concepts.	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice

CO2	Gain expertise in modern web technologies and frameworks.	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Develop the ability to build complex, scalable, and secure web applications	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
MHIMT 117 P	Mobile Application Development for Healthcare	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the fundamentals of mobile application development in the healthcare context	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Gain proficiency in modern mobile development technologies and frameworks.	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Develop the ability to design, implement, test, and deploy secure and effective mHealth applications.	PO8	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
MHIMT 118 P	Machine Learning in Healthcare	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the fundamental concepts and techniques of machine learning.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Gain proficiency in implementing machine learning algorithms using modern tools and frameworks.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Learn to train, evaluate and improve machine learning models.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
MHIMT 119 P	Data Visualization and Reporting in Healthcare	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Understand the fundamentals of data visualization and reporting in the healthcare context.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO2	Gain proficiency in using modern data visualization tools and technologies and to learn best practices for data reporting and presentation	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice
CO3	Develop the ability to create clear and effective visualizations that communicate complex healthcare data.	PO7	Practical, Assignment, Problem Based Learning, E-learning	Internal Exam, University Exam (Practical Exam), Viva-Voice

Semester IV

MHIMT 120 T	Bioethics, IPR and Biosafety	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Evaluate ethical concerns in biomedical and biotechnological practices.	PO5	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO2	Understand different types of IPR and their applications.	PO5	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
CO3	Apply various national and international guidelines in biomedical and health research.	PO5	Lecture, Demonstration, Group Discussion, Quiz, Assignment, Seminar	Internal Exam, University Exam (Theory Exam), Seminar, Assignment
MHIMT 114	Research Project / Dissertation	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Develop healthcare informatics solutions that align with industry standards and regulatory requirements.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
CO2	Evaluate healthcare challenges and design innovative IT-based interventions.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
CO3	Implement secure and interoperable health information systems using industry frameworks.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
CO4	Demonstrate project management skills to plan, execute, and optimize healthcare IT projects.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
CO5	Collaborate effectively with multidisciplinary teams to integrate healthcare and IT expertise.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
CO6	Assess system performance through testing and optimization to improve cybersecurity and efficiency.	PO1, PO8	Guidance & supervision along with documentation & reporting	University Exam (Seminar Presentation)
MHIMT 121	Internship	Mapped POs	Teaching-Learning Methodologies	Assessment Tools
CO1	Develop healthcare informatics solutions that align with industry		Experiential Learning at Industry/Research Institute/ Hospitals,	Internship Logbook, Weekly Summary Report, University

	standards and regulatory requirements.	PO1, PO4	Observation and Demonstration.	Exam (Seminar Presentation)
CO2	Apply health informatics methods to clinical workflows and care processes.	PO3, PO4	Experiential Learning at Industry/Research Institute/ Hospitals, Observation and Demonstration.	Internship Logbook, Weekly Summary Report, University Exam (Seminar Presentation)
CO3	Understand the practical health IT deliverable that meets local requirements and best industry practices.	PO1	Experiential Learning at Industry/Research Institute/ Hospitals, Observation and Demonstration.	Internship Logbook, Weekly Summary Report, University Exam (Seminar Presentation)
CO4	Analyze the data quality, privacy & governance and communicate findings to stakeholders	PO3	Experiential Learning at Industry/Research Institute/ Hospitals, Observation and Demonstration.	Internship Logbook, Weekly Summary Report, University Exam (Seminar Presentation)
CO5	Exhibit improved professional skills including communication, teamwork, adaptability, and workplace ethics.	PO5	Experiential Learning at Industry/Research Institute/ Hospitals, Observation and Demonstration.	Internship Logbook, Weekly Summary Report, University Exam (Seminar Presentation)

OUTLINE OF COURSE CURRICULUM

M.Sc. Health Informatics

Semester III

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MHIMT 112 T	Entrepreneurship and Health IT Project Management	4	-	-	-	4	60	-	-	-	60	20	80	100
MHIMT 113 T	Managing Health Information Systems	4	-	-	-	4	60	-	-	-	60	20	80	100
MHIMT 114	Research Project/ Dissertation	-	-	10	-	5	-	-	150	-	150	50	-	50
Discipline Specific Core Practical														
MHIMT 115 P	Database Management System	-	-	6	-	3	-	-	90	-	90	10	40	50
MHIMT 116 P	Advanced Web Development	-	-	8	-	4	-	-	120	-	120	10	40	50
MHIMT 117 P	Mobile Application Development for Health Care	-	-	8	-	4	-	-	120	-	120	10	40	50
MHIMT 118 P	Machine Learning in Health Care	-	-	8	-	4	-	-	120	-	120	10	40	50
MHIMT 119 P	Data Visualization and Reporting in Health Care	-	-	8	-	4	-	-	120	-	120	10	40	50
Total		8	0	32	0	24	120	0	480	0	600	120	280	400

OUTLINE OF COURSE CURRICULUM

M.Sc. Health Informatics

Semester IV

Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)/Experiential	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
Discipline Specific Core Theory														
MHIMT 120 T	Bioethics, IPR and Biosafety	3	-	-	-	3	45	-	-	-	45	20	80	100
Discipline Specific Core Practical														
MHIMT 114	Research Project/ Dissertation	-	-	22	-	11	-	-	330	-	330	-	200	200
MHIMT 121	Internship	-	-	-	18	6	-	-	-	270	270	-	50	50
Total		3	0	22	18	20	45	0	330	270	645	20	330	350

SECOND YEAR

M.Sc. Health Informatics

SEMESTER-III

Code No.	Core Subjects
Discipline Specific Core Theory	
MHIMT 112 T	Entrepreneurship and Health IT Project Management
MHIMT 113 T	Managing Health Information Systems
MHIMT 114	Research Project / Dissertation
Discipline Specific Core Practical	
MHIMT 115 P	Database Management System
MHIMT 116 P MHIMT 117 P	Advanced Web Development OR Mobile Application Development for Health Care
MHIMT 118 P MHIMT 119 P	Machine Learning in Healthcare OR Data Visualization and Reporting in Health Care

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Entrepreneurship and Health IT Project management
Subject Code	MHIMT 112 T

Learning Outcomes	<ul style="list-style-type: none"> • Understand the concept of Entrepreneurship • Understand and analysis of Entrepreneurial thinking and idea generation • Understand and analysis of new venture feasibility and business plans • Understand the basic concepts of Health IT project management and its importance • Understand and analyze the process of project initiation and planning • Understand and analyze the agile project management process and various principles associated with it • Understand and analyze various Health IT standards and regulations • Understanding the effective ways of Health IT project management and execution • Understand the process related to project closure and post-implementation
Course Outcomes	<ul style="list-style-type: none"> • Analyze the process of innovation and new idea generation and explain the business environment to identify business opportunities • Evaluate and apply different entrepreneurial strategies and assess the new venture feasibility and risk evaluation • Explain project management process, lifecycle and its organization. • Explain the monitoring, evaluation and control process involve in the project management

Sr. No.	Topics	No. of Hrs.
1	Introduction to Entrepreneurship <ul style="list-style-type: none"> • Introduction to entrepreneurship • Importance of entrepreneurship in economic development 	5
2	Business idea and Entrepreneurial venture planning <ul style="list-style-type: none"> • Entrepreneurial thinking and idea generation • Ideas from trend analysis, methods of generating ideas, creative problem solving, product planning, and development process • Critical factors of new venture development, the challenges of new-venture start-ups, pitfalls in selecting new venture, opportunity evaluation process 	6
3	New venture feasibility and Business plans <ul style="list-style-type: none"> • Environmental assessment, Market research and feasibility study and Financial feasibility • Different forms of ownership • List the different legal formalities for a new venture • Describe the cash management process 	6
4	Introduction to Health IT Project Management Overview of Project Management in Health IT: <ul style="list-style-type: none"> • Introduction to project management principles • Distinct characteristics and challenges of managing projects in the healthcare IT sector Importance of Project Management in Healthcare: <ul style="list-style-type: none"> • The impact of effective project management on healthcare outcomes 	7

	<ul style="list-style-type: none"> • Examples of successful healthcare projects and their contributions to improved patient care <p>Challenges and Opportunities in Health IT Projects:</p> <ul style="list-style-type: none"> • Common challenges such as interoperability, data security, and regulatory compliance • Identifying opportunities for innovation and improvement through IT projects <p>Case Studies of Health IT Projects:</p> <ul style="list-style-type: none"> • In-depth analysis of successful health IT projects • Lessons learned and best practices from real-world examples 	
5	<p>Project Initiation and Planning</p> <p>Stakeholder Identification and Analysis:</p> <ul style="list-style-type: none"> • Techniques for identifying and analyzing stakeholders • Strategies for effective stakeholder communication and engagement <p>Project Charter and Scope Definition:</p> <ul style="list-style-type: none"> • Developing a comprehensive project charter • Defining project scope, objectives, and deliverables <p>Risk Management in Health IT Projects:</p> <ul style="list-style-type: none"> • Identifying and assessing risks specific to health IT projects • Developing risk mitigation and contingency plans <p>Resource Planning and Allocation:</p> <ul style="list-style-type: none"> • Human resource management in health IT projects • Budgeting and allocating resources efficiently 	8
6	<p>Agile Project Management in Health IT</p> <p>Agile Methodologies in Healthcare:</p> <ul style="list-style-type: none"> • Introduction to Agile methodologies (Scrum, Kanban, etc.) • Agile values and principles adapted for healthcare settings <p>Scrum, Kanban, and Lean Principles:</p> <ul style="list-style-type: none"> • Detailed exploration of Scrum, Kanban, and Lean methodologies • Practical applications in health IT project environments <p>Agile Project Planning and Execution:</p> <ul style="list-style-type: none"> • Sprint planning and execution • Daily stand-ups, retrospectives, and other Agile ceremonies <p>Adapting Agile to Health IT Projects:</p> <ul style="list-style-type: none"> • Challenges and solutions for applying Agile in health IT • Hybrid approaches combining traditional and Agile methods 	8
7	<p>Health IT Standards</p> <p>Overview of Health IT Standards:</p> <ul style="list-style-type: none"> • Introduction to standards like HL7, DICOM, and CDA • The role of standards in achieving interoperability <p>Compliance with HIPAA and other Regulations:</p> <ul style="list-style-type: none"> • In-depth understanding of HIPAA requirements • Navigating other relevant healthcare regulations <p>Interoperability and Data Exchange in Healthcare:</p> <ul style="list-style-type: none"> • Strategies for achieving interoperability in health IT • Secure data exchange protocols and frameworks <p>Ethical Considerations in Health IT:</p> <ul style="list-style-type: none"> • Addressing ethical issues related to patient data, AI, and emerging technologies • Ethical decision-making in health IT project management 	7

8	<p>Health IT Project Execution and Monitoring</p> <p>Team Management and Leadership:</p> <ul style="list-style-type: none"> • Effective leadership in health IT projects • Building and managing high-performing project teams <p>Quality Assurance in Health IT Projects:</p> <ul style="list-style-type: none"> • Ensuring quality in health IT deliverables • Implementing QA processes and methodologies <p>Monitoring and Controlling Health IT Projects:</p> <ul style="list-style-type: none"> • Monitoring project progress and performance metrics • Implementing change control and issue resolution <p>Change Management in Healthcare Settings:</p> <ul style="list-style-type: none"> • Strategies for managing resistance to change • Incorporating change management into project plans 	7
9	<p>Project Closure and Evaluation</p> <p>Project Closure Processes:</p> <ul style="list-style-type: none"> • Closing out health IT projects effectively • Transitioning deliverables to end-users or support teams <p>Post-Implementation Evaluation:</p> <ul style="list-style-type: none"> • Assessing project success against initial objectives • Gathering feedback from stakeholders for continuous improvement <p>Project Documentation and Knowledge Transfer:</p> <ul style="list-style-type: none"> • The importance of comprehensive project documentation • Strategies for knowledge transfer to support and operational teams 	6
Total		60 hrs.

Bibliography:**Main Reference:**

1. Hisrich, R. D., Manimala, M. J., Peters, M. P & Shepherd. D.A. (2014). Entrepreneurship. (9th Ede) McGraw Hill Education: New Delhi.
2. "Project Management for Healthcare" by David Shirley
3. "Renovating healthcare IT: Building the foundation for digital transformation" by Susan Snedaker
4. "Health Informatics: Practical Guide Seventh Edition" by William R Hersh, Robert E Hoyt
5. "Agile Project Management For Dummies 3e (For Dummies (Computer/Tech))" by Mark C. Layton, Steven J. Ostermiller, Dean J. Kynaston
6. "Agile Project Management with Scrum (Developer Best Practices)" by Ken Schwaber

Additional Reference:

1. Kathy Schwalbe, Dan Furlong. Healthcare Project Management. Kathy Schwalbe LLC, 2013
2. David Sherly. Project Management for Healthcare. CRS Press. Taylor & Francis Group
3. Kuratko, D. F. (2016). Entrepreneurship: Theory, process, and practice. Cengage Learning.

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Managing Health Information Systems
Subject Code	MHIMT 113 T

Learning Outcomes	<ul style="list-style-type: none"> • Understand the basics of HIS and importance • Understand, analyze and apply the principles of HIS project planning • Understand and analyze the process of organizing health information services in a hospital set up • Understand how to do resource management while implementing a HIS project • Understand and analyze the process of monitoring and controlling of HISs • Understand the role of Leadership in strategic planning of HIS project • Understand and analyze how the adoption of health information system affects the culture of a healthcare organization • Understand and apply the knowledge management concepts in Healthcare • Understand and analyze various QA approach in implementing and managing health information system in a hospital setup • Understand and analyze the core concepts of IG in healthcare
Course Outcomes	<ul style="list-style-type: none"> • Plan, Monitor, organization and control the health Information system and its resources required for managing patient data • Demonstrate the leadership role in healthcare IT projects and related activities • Analyze the Benefits, Cultural Challenges, and issues in adopting health information system and application. • Demonstrate the application of knowledge management system in healthcare organization • Develop various QA approach in implementing and managing health information system • Apply the concept of Information Governance in managing healthcare and healthcare data management

Sr. No.	Topics	No. of Hrs.
1	Health Information System – An Overview <ol style="list-style-type: none"> 1. Component of health information system suggested by world health organization 2. Types of Health Information Systems 3. Functions of health information system in terms of customer perspective. 4. Reasons of implementing health information system in a hospital setup. 5. Support of health information system in clinical, enterprise and technical perspective. 	5
2	Planning of Health Information System <ol style="list-style-type: none"> 1. List and explain the steps involve in the strategic planning of health information system 2. Discussion about how a good project management supports the successful implementation of Health Information Technology. 3. Outline and explain the technology infrastructure required for the successful implementation and sustainability of health information system. 4. Importance of tactical planning in implementing strategic planning of health information system. 	5
3	Organizing Information System Services <ol style="list-style-type: none"> 1. Roles the IT staff performs during the delivery of HIS services 2. Process of Organizing Health Information services in a hospital set up 	5

	<ol style="list-style-type: none"> 3. Understand the staffing pattern used in a hospital setup to organize health information service 4. Advantages & Disadvantages of Source oriented, Integrated and problem-oriented health records 5. Management Role's in major HIS projects 6. Various rules involved in designing forms 	
4	<p>Resource Management</p> <ol style="list-style-type: none"> 1. Resource management activities involve in implementing and managing health information system 2. Roles of the health informatics professionals in resource management 3. Human and technical resources required for the successful implementation and sustainability of health information system. 	5
5	<p>Monitoring and Controlling of Health Information System</p> <ol style="list-style-type: none"> 1. Task involved in controlling and managing IT in healthcare. 2. 3LGM2 metamodel for modelling health information system. 3. Phases involve in good evaluation practice of health informatics application. 4. Processes to ensure the privacy and protection of health information. 5. Use of balanced score card monitoring the performance of Health Information System. 	5
6	<p>Leadership in HIS Projects</p> <ol style="list-style-type: none"> 1. Leadership role of health informatics professionals in strategic planning of HIS project. 2. Principles of strategic leadership 	5
7	<p>Adoption of Information Technology in Healthcare</p> <ol style="list-style-type: none"> 1. How the adoption of health information system affects the culture of a healthcare organization. 2. Issues associated with the adoption of information technology in healthcare. 3. Benefits of adopting health informatics application. 	5
8	<p>Knowledge Management in IT</p> <ol style="list-style-type: none"> 1. Application of knowledge management system in healthcare organization using a case. 2. Reason for managing knowledge in healthcare. 3. Methods used in capturing and organizing knowledge in healthcare. 	5
9	<p>Quality Assurance Approach in Managing HIS</p> <ol style="list-style-type: none"> 1. Primary elements of Total Quality Management 2. Approach of TQM in implementing and maintaining HIS. 3. Various QA approach in implementing and managing health information system in a hospital setup. 4. Importance of various CQI approach in implementing and maintaining HIS. 5. Role of health informatics professionals in implementing TQM and CQI approach. 	5
10	<p>Core Concepts of Information Governance in Healthcare</p> <ol style="list-style-type: none"> 1. Introduction to Information Governance <ul style="list-style-type: none"> • Definition and significance • Needs and benefits 2. Information Governance Models <ul style="list-style-type: none"> • IGRM, IGIM, IGMM • Application of these models with case studies in healthcare settings 3. Healthcare Data Management Under Information Governance <ul style="list-style-type: none"> • Healthcare data structure • Management and governance of healthcare data • Role of GDPR in healthcare data governance 4. Stakeholders in Information Governance <ul style="list-style-type: none"> • Identification of key stakeholders • Role and expectations of stakeholders in building Information Governance in Healthcare • Best practices of Information Governance nationally and globally 	7

11	<p>Ethical and Technological Aspects of Information Governance</p> <ol style="list-style-type: none"> 1. Ethics in Information Governance <ul style="list-style-type: none"> • Key ethical principles (Autonomy, Beneficence, Non-maleficence, Justice, Accountability, Transparency) • Data privacy and confidentiality, including legal frameworks (HIPAA, GDPR) • Ethical considerations in health information technologies (EHRs, patient consent, data sharing) 2. Information Technology in Support of Information Governance <ul style="list-style-type: none"> • Role of IT in building Information Governance • HIT standards and their relevance in interoperability and health information exchange 3. Data Security and Protection <ul style="list-style-type: none"> • Ethical implications of data breaches • Strategies for ensuring data security and balancing security with accessibility 4. Emerging Technologies and Ethical Challenges <ul style="list-style-type: none"> • Ethical considerations in AI, ML, and big data analytics • Bias, fairness, and impact on patient care • Data ownership, control, and informed consent 	8
Total		60 hrs.

Bibliography:**Main Reference:**

1. Today's Health Information Approach. Dana C Macway
2. Health Information System – Architecture and Strategies. Alfred Winter, R Haux, E Ammenwerth, B Brigl, N Hellrung, F, Jahn
3. Health Information System. Kevin Beaver
4. Leading Information Governance for Healthcare. American Health Information Management Association
5. Robert F Smallwood. Information Governance: Concept, Strategies and Best Practice. April 2014. Wiley Publication
6. Anthony David Giordano. Performing Information Governance. 2015 Edition. IBM Press

Additional Reference:

1. Health Information System – Concept, Methodologies, Tools and Applications. Joel Rodrigues
2. Healthcare Information Systems- A Practical Approach for Healthcare Management. Karen A Wager, F W Lee, J P Glaser
3. John Lannrelli, Micheal O'Shaughnessy. Information Governance and Security. 2015 Edition. Elsevier
4. Evelyn J S Hovenga, Heather Grain. Health Information Governance in Digital Environment. 2013 Edition. IOS Press

Name of the Program	M. Sc. Health Informatics
Semester	Semester III
Name of the Subject	Research Project / Dissertation
Subject Code	MHIMT 114

Learning Outcomes	<ul style="list-style-type: none"> • Apply informatics principles to design and develop healthcare solutions. • Ensure compliance with industry standards such as HL7, FHIR, and HIPAA. • Analyze healthcare challenges and propose effective IT solutions. • Manage healthcare IT projects, ensuring secure, interoperable, and data-driven system implementation. • Demonstrate critical thinking and problem-solving skills for Health IT innovation. • Communicate effectively with healthcare professionals and IT teams to facilitate collaboration. • Test, evaluate, and optimize healthcare systems to enhance usability, cybersecurity, and efficiency. • Prepare for real-world Health IT innovation and implementation through hands-on experience.
Course Outcomes	<ul style="list-style-type: none"> • Develop healthcare informatics solutions that align with industry standards and regulatory requirements. • Evaluate healthcare challenges and design innovative IT-based interventions. • Implement secure and interoperable health information systems using industry frameworks. • Demonstrate project management skills to plan, execute, and optimize healthcare IT projects. • Collaborate effectively with multidisciplinary teams to integrate healthcare and IT expertise. • Assess system performance through testing and optimization to improve cybersecurity and efficiency.

***The Dissertation/Project will begin from 3rd Semester and will continue through the 4th Semester. (150 hrs.)**

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Database Management System
Subject Code	MHIMT 115 P

Learning Outcomes	<ul style="list-style-type: none"> • Explain the fundamental concepts of Relational Database Management Systems (RDBMS). • Design and model databases using appropriate database design principles. • Construct and execute SQL queries for data retrieval and manipulation. • Utilize advanced MySQL features to optimize database performance. • Implement database security measures, data integrity constraints, backup, and recovery techniques. • Analyze future trends and emerging technologies in database management.
Course Outcomes	<ul style="list-style-type: none"> • Understand the core principles of database management systems, including data modeling, database architecture, and normalization techniques. • Develop proficiency in using Structured Query Language (SQL) for data definition, manipulation, and querying within MySQL. • Learn to design and implement databases that are efficient, scalable, and secure, applying best practices in data modeling and normalization. • Apply theoretical knowledge through practical lab sessions and projects, developing real-world databases and solving complex data management problems.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Database Management Systems Overview of Database Systems <ul style="list-style-type: none"> • Definition and Purpose of a Database Management System (DBMS) • Components of a DBMS • Types of DBMS (Hierarchical, Network, Relational, and Object-Oriented) Introduction to MySQL <ul style="list-style-type: none"> • Overview of MySQL as a Relational Database Management System (RDBMS) • Installation and Setup of MySQL • Basic MySQL Commands and Interface Database Models <ul style="list-style-type: none"> • Conceptual, Logical, and Physical Models • Entity-Relationship (ER) Model • Introduction to Relational Model and Tables 	15
2	Database Design and Data Modeling Data Modeling Concepts <ul style="list-style-type: none"> • Entity-Relationship Diagrams (ERDs) • Entities, Attributes, and Relationships • Cardinality and Participation Constraints Normalization <ul style="list-style-type: none"> • Purpose of Normalization • First, Second, and Third Normal Forms (1NF, 2NF, 3NF) • Denormalization and its Applications Designing a Database Schema <ul style="list-style-type: none"> • Converting ER Diagrams to Relational Schema • Defining Tables, Primary Keys, and Foreign Keys • Relationships and Referential Integrity 	15

3	<p>SQL and MySQL Fundamentals Database Schema</p> <p>SQL Basics</p> <ul style="list-style-type: none"> • Introduction to Structured Query Language (SQL) • Data Definition Language (DDL): CREATE, ALTER, DROP • Data Manipulation Language (DML): SELECT, INSERT, UPDATE, DELETE <p>Querying and Filtering Data</p> <ul style="list-style-type: none"> • Basic SELECT Queries • Filtering Data with WHERE Clauses • Sorting and Ordering Results • Using Aggregate Functions (SUM, AVG, COUNT, etc.) <p>Joins and Subqueries</p> <ul style="list-style-type: none"> • Types of Joins: INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL JOIN • Using Subqueries and Nested Queries • Combining Results with UNION and INTERSECT 	18
4	<p>Advanced MySQL Features</p> <p>Indexing and Performance Optimization</p> <ul style="list-style-type: none"> • Purpose and Types of Indexes • Creating and Managing Indexes • Query Optimization Techniques <p>Transactions and Concurrency Control</p> <ul style="list-style-type: none"> • Concepts of Transactions and ACID Properties (Atomicity, Consistency, Isolation, Durability) • Implementing Transactions in MySQL • Concurrency Control and Locking Mechanisms <p>Stored Procedures and Triggers</p> <ul style="list-style-type: none"> • Creating and Using Stored Procedures • Writing and Managing Triggers • Using Views to Simplify Complex Queries 	17
5	<p>Database Security and Integrity</p> <p>Security Measures</p> <ul style="list-style-type: none"> • User Authentication and Authorization • Granting and Revoking Privileges • Securing Data with Encryption <p>Data Integrity and Constraints</p> <ul style="list-style-type: none"> • Defining Constraints: UNIQUE, NOT NULL, CHECK • Implementing Referential Integrity • Handling Errors and Data Validation <p>Backup and Recovery</p> <ul style="list-style-type: none"> • Backup Strategies: Full, Incremental, and Differential Backups • Restoring Data from Backups • Using MySQL Backup Tools 	15
6	<p>Future Trends in Database Technology</p> <p>Emerging Database Technologies</p> <ul style="list-style-type: none"> • Introduction to NoSQL Databases (e.g., MongoDB, Cassandra) • Cloud-Based Databases and Database-as-a-Service (DBaaS) • Big Data Technologies and Integration with SQL 	10
Total		90 hrs.

Bibliography:

1. Database system Concepts, Third Edition, Abraham Silberschatz (Bell Laboratories), Henry F, Korth (Bell Laboratories) and S. Sudarshan (Indian Institute of Technology, Bombay) McGraw-Hill Companies, Inc.
2. Fundamentals of Database systems, Third Edition. Author: Elmasri and Navathe
3. Efficient MySQL Performance: Best Practices and Techniques By Daniel Nichter
4. MySQL Crash Course By Rick Silva

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Advanced Web Development
Subject Code	MHIMT 116 P

Learning Outcomes	<ul style="list-style-type: none"> • Understanding the concepts of advanced HTML and CSS • Understanding and applying the Advanced JavaScript functionalities and ES6+ • Understanding and applying the concepts of Server-Side Development with Node.js • Understanding and applying the concepts of Advanced Front-End Development • Understanding and applying the concepts of DevOps and Deployment • Understanding and applying the concepts of Web Security
Course Outcomes	<ul style="list-style-type: none"> • Understanding of advanced web development concepts. • Gain expertise in modern web technologies and frameworks. • Develop the ability to build complex, scalable, and secure web applications.

Sr. No.	Topics	No. of Hrs.
1	Advanced HTML and CSS HTML5 Advanced Features: <ul style="list-style-type: none"> • Semantic elements • Web forms 2.0 • Multimedia elements (audio, video) • Canvas and SVG graphics CSS3 Advanced Techniques: <ul style="list-style-type: none"> • CSS preprocessors (Sass, LESS) • Advanced layout techniques (CSS Grid, Flexbox) • CSS animations and transitions • Responsive design and media queries 	20
2	Advanced JavaScript and ES6+ Modern JavaScript Syntax: <ul style="list-style-type: none"> • ES6+ features (let, const, arrow functions, template literals) • Modules and classes Advanced JavaScript Concepts: <ul style="list-style-type: none"> • Closures, hoisting, and scope • Asynchronous programming (promises, async/await) • Event loop and concurrency. JavaScript Frameworks and Libraries: <ul style="list-style-type: none"> • Deep dive into React • Component lifecycle and hooks 	20
3	Server-Side Development with Node.js Node.js and Express.js: <ul style="list-style-type: none"> • Setting up a Node.js server • Building RESTful APIs with Express.js • Middleware and routing Database Integration: <ul style="list-style-type: none"> • SQL databases (PostgreSQL, MySQL) • NoSQL databases (MongoDB, Firebase) Authentication and Authorization:	20

	<ul style="list-style-type: none"> • JWT and OAuth • Role-based access control • Secure password storage and hashing 	
4	<p>Advanced Front-End Development</p> <p>Single Page Applications (SPAs):</p> <ul style="list-style-type: none"> • Architecture and design patterns • Client-side routing • State management in SPAs <p>Progressive Web Apps (PWAs):</p> <ul style="list-style-type: none"> • Service workers and caching • Offline capabilities • Web app manifest <p>Web Performance Optimization:</p> <ul style="list-style-type: none"> • Lazy loading and code splitting • Performance monitoring tools • Best practices for optimizing web performance 	20
5	<p>DevOps and Deployment</p> <p>Version Control and CI/CD:</p> <ul style="list-style-type: none"> • Advanced Git techniques (rebasing, cherry-picking) • Continuous Integration/Continuous Deployment (CI/CD) pipelines • Automated testing and deployment <p>Containerization and Orchestration:</p> <ul style="list-style-type: none"> • Docker basics and containerization • Deploying applications with Docker <p>Cloud Services and Hosting:</p> <ul style="list-style-type: none"> • Cloud platforms (AWS, Heroku, Azure, Google Cloud) • Serverless architecture • Scaling and load balancing 	20
6	<p>Web Security</p> <p>Security Best Practices:</p> <ul style="list-style-type: none"> • Secure coding practices • Common vulnerabilities (XSS, CSRF, SQL Injection) • OWASP Top Ten <p>Implementing Security Measures:</p> <ul style="list-style-type: none"> • HTTPS and SSL/TLS • Content Security Policy (CSP) • Security headers <p>Monitoring and Incident Response:</p> <ul style="list-style-type: none"> • Logging and monitoring • Incident response planning • Tools for security monitoring 	20
Total		120 hrs.

Bibliography:

1. Flanagan, D. (2020). JavaScript: The Definitive Guide. O'Reilly Media.
2. Hartl, M. (2019). Ruby on Rails Tutorial: Learn Web Development with Rails. Addison-Wesley.
3. Duckett, J. (2014). JavaScript and J Query: Interactive Front-End Web Development. Wiley.
4. Marks, K. E. (Year). PHP Web Development with MySQL. PHP [architect].
5. Grinberg, M. (2018). Flask Web Development: Developing Web Applications with Python. O'Reilly Media.
6. Vincent, W. S. (2020). Django for Beginners: Build Websites with Python and Django. Welcome To Code.

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Mobile Application Development for Health Care
Subject Code	MHIMT 117 P

Learning Outcomes	<ul style="list-style-type: none"> • Understand the basics of mHealth applications • Understand, apply and analyze User-Centered mHealth Design Principles • Understand and apply the concepts of mobile application development to mHealth applications • Understand and apply various techniques to test and deploy the mHealth application also analyze the security measures • Understand and analyze the emerging trends and future direction of mHealth applications
Course Outcomes	<ul style="list-style-type: none"> • Understand the fundamentals of mobile application development in the healthcare context • Gain proficiency in modern mobile development technologies and frameworks. • Develop the ability to design, implement, test, and deploy secure and effective mHealth applications.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Mobile Health (mHealth) Applications Overview of mHealth <ul style="list-style-type: none"> • Definition and scope • Benefits and challenges • Historical evolution and current trends Mobile Platforms and Technologies <ul style="list-style-type: none"> • Overview of mobile operating systems (iOS, Android) • Development environments and tools • Key technologies: Bluetooth, NFC, sensors mHealth Ecosystem <ul style="list-style-type: none"> • Stakeholders in mHealth (patients, providers, payers) • Integration with existing healthcare systems (EHR, telemedicine) • Case studies of successful mHealth applications 	24
2	Mobile Application Design for Healthcare User-Centered Design Principles <ul style="list-style-type: none"> • Understanding user needs • Design thinking process • Creating personas and user journeys UI/UX Design for mHealth Applications <ul style="list-style-type: none"> • Principles of effective UI/UX design • Accessibility and usability considerations • Tools for prototyping and design Regulatory and Compliance Requirements <ul style="list-style-type: none"> • HIPAA, GDPR, and other regulations • Ensuring privacy and security in design • Ethical considerations in mHealth applications 	24
3	Mobile Application Development	24

	<p>Introduction to Mobile Programming</p> <ul style="list-style-type: none"> • Programming languages (Swift, Kotlin, Java) • Development frameworks (React Native, Flutter) <p>Setting up development environments</p> <ul style="list-style-type: none"> • Backend Development and Integration • Overview of backend technologies • RESTful APIs and integration with cloud services • Data storage and management <p>Developing mHealth Features</p> <ul style="list-style-type: none"> • Implementing health-related features (monitoring, alerts, reminders) • Utilizing mobile sensors and wearables • Integration with third-party health services 	
4	<p>Testing and Deployment of mHealth Applications</p> <p>Testing Mobile Applications</p> <ul style="list-style-type: none"> • Types of testing (unit, integration, user acceptance) • Automated testing tools and frameworks • Ensuring app performance and reliability <p>Deployment and Distribution</p> <ul style="list-style-type: none"> • App store guidelines (Apple App Store, Google Play) • Continuous integration and deployment (CI/CD) practices • Post-deployment monitoring and updates <p>Security and Maintenance</p> <ul style="list-style-type: none"> • Ensuring data security and user privacy • Handling updates and maintenance • Responding to security incidents 	24
5	<p>Emerging Trends and Future Directions in mHealth</p> <p>Artificial Intelligence and Machine Learning</p> <ul style="list-style-type: none"> • AI applications in mHealth • Machine learning models for health data • Ethical considerations of AI in healthcare <p>Telemedicine and Remote Monitoring</p> <ul style="list-style-type: none"> • Technologies enabling telemedicine • Design approach for remote patient monitoring • Case studies and future outlook <p>Wearable's and IoT in Healthcare</p> <ul style="list-style-type: none"> • Overview of healthcare wearable's • Integration with IoT devices • Future trends in wearable technology 	24
Total		120 hrs.

Bibliography:

1. "mHealth: Transforming Healthcare" by Robert S. H. Istepanian, Bryan Woodward
2. "Healthcare Information Technology Exam Guide for CHTS and CAHIMS Certifications" by Kathleen A. McCormick, Brian Gugerty
3. "Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things" by Jonathan Follett
4. "Health Informatics: Practical Guide" by William R. Hersh
5. "Mobile Health: Sensors, Analytic Methods, and Applications" by James M. Rehg, Susan Murphy, Santosh Kumar

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Machine Learning in Health Care
Subject Code	MHIMT 118 P

Learning Outcomes	<ul style="list-style-type: none"> • Understand the basics of Machine Learning • Understanding and application of the ANNs • Understand and analyze the main challenges of ML models • Understanding and applications of various Classification Algorithms • Understanding and applications of various Regression Algorithms • Understand and analyze various ML model evaluation matrices
Course Outcomes	<ul style="list-style-type: none"> • Understand the fundamental concepts and techniques of machine learning. • Gain proficiency in implementing machine learning algorithms using modern tools and frameworks. • Learn to train, evaluate and improve machine learning models.

Sr. No.	Topics	No. of Hrs.
1	<p>Fundamentals of Machine Learning</p> <p>Introduction:</p> <ul style="list-style-type: none"> • What is AI? • Examples of AI • What is Machine Learning? • Examples of Machine Learning • What is Deep Learning? • Example of Deep Learning • AI vs Machine Learning vs Deep Learning • How does Machine Learning work? <p>Types of Machine Learning with examples:</p> <ul style="list-style-type: none"> • Supervised Learning • Unsupervised Learning • Reinforcement Learning • Instance-Based Learning Vs. Model-Based Learning <p>Training, validation, and test sets</p> <p>Jupyter Notebook Tutorial</p> <p>The universal workflow of machine learning:</p> <ul style="list-style-type: none"> • Defining the problem and assembling a dataset • Choosing a measure of success • Deciding on an evaluation protocol • Preparing data • Developing a model that does better than a baseline • Scaling up: developing a model that overfits • Regularizing the model and tuning the hyperparameters <p>Dimensionality Reduction:</p> <ul style="list-style-type: none"> • Feature Engineering • Principal Component Analysis (PCA) • Partial Least Squares 	20
2	Introduction to Artificial Neural Networks	20

	Biological Neurons Neural Networks Artificial Neural Networks Activation Functions Feed Forward Neural Networks: The Perceptron Multilayer Feed Forward Neural Networks	
3	Main Challenges of Machine Learning Data pre-processing and feature learning: <ul style="list-style-type: none"> • Data Cleaning • Handling Text and Categorical Attributes • Custom transformers • Feature Scaling Classification vs. Regression Insufficient Quantity of training data Non-representative Training data Poor-Quality Data Irrelevant Features Over fitting the training data Under fitting the training data Testing and Validating Hyper parameter Tuning and Model Selection Data Mismatch	20
4	Classification Algorithms Decision Tree Classification K-Nearest Neighbors (KNN) Logistic Regression Naïve Bayes Random Forest Classification Support Vector Machines (SVM)	20
5	Regression Algorithms Linear / Ridge / Lasso Regression Decision Tree Regression Principal Components Regression Polynomial Regression Random Forest Regression Support Vector Regression	20
6	Select and Train a Model Model Evaluation Metrics: <ul style="list-style-type: none"> • Confusion Matrix • Jaccard Index • Kolomogorov Smirnov chart • Gini Coefficient etc. Training & Evaluating on the Training set Better Evaluation using Cross-validation Fine Tuning the model, Ensemble Methods Analyze the Best Models and Their Errors, Evaluate the developed model on the Test Set	20
Total		120 hrs

Bibliography:

1. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron
3. Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido

Name of the Program	M.Sc. Health Informatics
Semester	Semester III
Name of the Subject	Data Visualization and Reporting in Health Care
Subject Code	MHIMT 119 P

Learning Outcomes	<ul style="list-style-type: none"> • Understanding the basic concepts of Data Visualization • Understanding and application of various visualization effect • Understanding and application of Advanced Data Visualization Techniques • Understanding about the various reporting techniques in Healthcare • Understanding the recent data visualization and reporting technologies and future trends
Course Outcomes	<ul style="list-style-type: none"> • Understand the fundamentals of data visualization and reporting in the healthcare context. • Gain proficiency in using modern data visualization tools and technologies and to learn best practices for data reporting and presentation • Develop the ability to create clear and effective visualizations that communicate complex healthcare data.

Sr. No.	Topics	No. of Hrs.
1	<p>Introduction to Data Visualization</p> <p>Fundamentals of Data Visualization</p> <ul style="list-style-type: none"> • Definition and importance of data visualization • Historical evolution and key milestones • Principles of effective data visualization <p>Types of Data Visualization</p> <ul style="list-style-type: none"> • Common types of charts and graphs (bar, line, pie, scatter) • Specialized healthcare visualizations (heat maps, time series, dashboards) • Choosing the right visualization for the data <p>Tools and Software for Data Visualization</p> <ul style="list-style-type: none"> • Introduction to visualization tools (Tableau, Power BI, Qlik) • Overview of programming languages (Python, R) and libraries (Matplotlib, Seaborn, ggplot2) • Setting up visualization environments 	24
2	<p>Designing Effective Visualizations</p> <p>Data Preparation and Cleaning</p> <ul style="list-style-type: none"> • Data sources and collection methods • Data preprocessing techniques • Handling missing and inconsistent data <p>Visual Design Principles</p> <ul style="list-style-type: none"> • Color theory and usage in visualizations • Typography and layout considerations • Accessibility and inclusivity in design <p>Storytelling with Data</p> <ul style="list-style-type: none"> • Crafting a narrative with data • Techniques for highlighting key insights • Case studies of effective data storytelling in healthcare 	24
3	<p>Advanced Data Visualization Techniques</p> <p>Interactive Visualizations</p>	24

	<ul style="list-style-type: none"> • Creating interactive charts and dashboards • Using tools like Tableau and Power BI for interactivity • Implementing interactivity with D3.js <p>Geospatial Visualizations</p> <ul style="list-style-type: none"> • Introduction to geographic information systems (GIS) • Visualizing healthcare data on maps • Tools and libraries for geospatial visualization (Leaflet, GeoPandas) <p>Big Data Visualization</p> <ul style="list-style-type: none"> • Challenges of visualizing large datasets • Techniques for handling and visualizing big data • Using cloud-based tools for big data visualization (Google Data Studio, AWS Quick Sight) 	
4	<p>Reporting in Healthcare</p> <p>Principles of Effective Reporting</p> <ul style="list-style-type: none"> • Components of a good report • Structuring reports for different audiences • Best practices for clear and concise reporting <p>Tools for Creating Reports</p> <ul style="list-style-type: none"> • Overview of reporting tools (Microsoft Excel, Power BI, Tableau) • Integrating visualizations into reports • Automation of report generation <p>Regulatory and Compliance Considerations</p> <ul style="list-style-type: none"> • Understanding healthcare regulations (HIPAA, GDPR) • Ensuring data privacy and security in reports • Ethical considerations in healthcare reporting 	24
5	<p>Recent Technologies and Future Trends</p> <p>Machine Learning and AI in Data Visualization</p> <ul style="list-style-type: none"> • Leveraging machine learning for advanced visualizations • AI-driven insights and automated analysis • Tools and frameworks for integrating AI (Tensor Flow, PyTorch) <p>Real-Time Data Visualization</p> <ul style="list-style-type: none"> • Techniques for real-time data streaming and visualization • Applications in healthcare monitoring and diagnostics • Tools for real-time visualization (Grafana, Kibana) <p>Future Directions in Data Visualization</p> <ul style="list-style-type: none"> • Emerging technologies and trends • The impact of virtual reality (VR) and augmented reality (AR) on data visualization • The future of data visualization in healthcare 	24
Total		120 hrs

Bibliography:

1. "Storytelling with Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic
2. "The Visual Display of Quantitative Information" by Edward R. Tufte
3. "Data Visualization: A Practical Introduction" by Kieran Healy
4. "Interactive Data Visualization for the Web" by Scott Murray
5. "Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master" by Ryan Sleeper

SECOND YEAR**M.Sc. HEALTH INFORMATICS****SEMESTER- IV**

Code No.	Core Subject
Discipline Specific Core Theory	
MHIMT 120 T	Bioethics, IPR and Biosafety
Discipline Specific Core Practical	
MHIMT 114	Research Project / Dissertation
MHIMT 121	Internship

Name of the Program	M.Sc. Health Informatics
Semester	Semester IV
Name of the Subject	Bioethics, IPR and Biosafety
Subject Code	MHIMT 120 T

Learning Outcomes	<ul style="list-style-type: none"> To familiarize students with ethical issues in biomedical research and healthcare. To provide knowledge about intellectual property rights and their relevance in biotechnology. To understand biosafety principles and regulatory frameworks related to research and product development.
Course Outcomes	<ul style="list-style-type: none"> Evaluate ethical concerns in biomedical and biotechnological practices. Understand different types of IPR and their applications. Apply various national and international guidelines in biomedical and health research.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Bioethics: Principles of biomedical ethics: autonomy, beneficence, non-maleficence, justice. Ethics in clinical research: Informed consent, confidentiality, human and animal experimentation. Ethical guidelines: ICMR, DHR, ANRF, Helsinki Declaration, Belmont Report. Case studies in biomedical ethics.	11
2	Intellectual Property Rights (IPR): Types of IPR: Patents, Copyrights, Trademarks, Trade secrets, Plant variety protection. Patent filing process (India and international). Patentability criteria and limitations in biotechnology. Importance of IPR in academia and industry.	11
3	Biosafety and Biosecurity: Definition and classification of biological hazards, Risk assessment and management in laboratory and field research, Containment facilities: Biosafety levels (BSL I–IV), Guidelines: Cartagena Protocol, NIH Guidelines, DBT & WHO norms, Dual-use research and bioterrorism concerns.	11
4	Regulatory Frameworks and Institutional Oversight: Institutional Biosafety Committee (IBSC), Review Boards, Ethical Committees. NABH, NABH Digital Health Standards for Hospitals, NABL, JCI, ISO. National and international regulatory bodies: RCGM, GEAC, CDSCO, WHO. Biosafety and ethics in genome editing (e.g., CRISPR), stem cell research, GMOs. Recent advancements and controversies. Cyber Security, HIPAA, GDPR, DPDP Act 2023 India.	12
Total		45 hrs.

Reference book:

- Bioethics & Biosafety** – R. C. Dubey
- Intellectual Property Rights in Biotechnology** – P. Narayanan
- Bioethics and Biosafety in Biotechnology** – V. Sree Krishna
- ICMR Ethical Guidelines for Biomedical Research** (latest version)
- WIPO, DBT, ICMR, DHR, ANRF, NABH, NABL, HIPAA, GDPR, DPDP Act 2023, India and WHO online resources.

Name of the Program	M. Sc. Health Informatics
Semester	Semester IV
Name of the Subject	Research Project / Dissertation
Subject Code	MHIMT 114

Learning Outcomes	<ul style="list-style-type: none"> • Apply informatics principles to design and develop healthcare solutions. • Ensure compliance with industry standards such as HL7, FHIR, and HIPAA. • Analyze healthcare challenges and propose effective IT solutions. • Manage healthcare IT projects, ensuring secure, interoperable, and data-driven system implementation. • Demonstrate critical thinking and problem-solving skills for Health IT innovation. • Communicate effectively with healthcare professionals and IT teams to facilitate collaboration. • Test, evaluate, and optimize healthcare systems to enhance usability, cybersecurity, and efficiency. • Prepare for real-world Health IT innovation and implementation through hands-on experience.
Course Outcomes	<ul style="list-style-type: none"> • Develop healthcare informatics solutions that align with industry standards and regulatory requirements. • Evaluate healthcare challenges and design innovative IT-based interventions. • Implement secure and interoperable health information systems using industry frameworks. • Demonstrate project management skills to plan, execute, and optimize healthcare IT projects. • Collaborate effectively with multidisciplinary teams to integrate healthcare and IT expertise. • Assess system performance through testing and optimization to improve cybersecurity and efficiency.

The Dissertation/Project work will begin from 3rd Semester (150 hrs.) and will continue through the 4th Semester (330 hrs.)

1. Dissertation/Project work should be carried out as an individual Dissertation.
2. The students will carry independent project work under the supervision of the staff of Department on the topic assigned to him/her. In house projects are encouraged. Students may be allowed to carry out the project work in other Departmental laboratories/ Research institutes / Industries as per the availability of Infrastructure.
3. Co-guides from the other institutions may be allowed.
4. The Dissertation/ Project work will begin from 3rd Semester, and will continue through the 4th Semester.
5. The Dissertation/ Project report (also developed application shall be presented at the time of presentation and viva voce) will be submitted at the end of the 4th Semester and evaluated.
6. Five copies of the project report shall be submitted to the Director, SBS.
7. To conduct of the End Semester Examination and evaluation of Dissertation/ Project work the University will appoint External Examiners.
8. Since the dissertation is by research, Dissertation/ Project work carries a total of 250 marks and evaluation will be carried out by both internal and external evaluators.
9. The student has to defend his/her Dissertation/Project Work in a seminar which will be evaluated by an internal and external experts appointed by the University.
10. The assignment of marks for Project/ Dissertation is as follows:
 - Part I – (3rd Semester)
Topic Selection, Review of Literature, Novelty of works:50 marks
 - Part II – (4th Semester)
 - a. Continuous Internal Assessment, Novelty, Overall Work Culture: 100 Marks
 - b. Dissertation/ Project work book: 50 Marks
 - c. Viva-Voce: 50 Marks
 - d. However, a student in 4th semester will have to do mandatory “**Bioethics, IPR and Biosafety**” course in addition to his Dissertation/ Project work in the parent department.

Name of the Program	M. Sc. Health Informatics
Semester	Semester IV
Name of the Subject	Internship
Subject Code	MHIMT 121

Learning Outcomes	<ul style="list-style-type: none"> • To provide a structured learning experience that enhances students' technical, analytical, and professional skills while addressing the evolving needs of healthcare organizations. • By integrating academic knowledge with hands-on practice, these internships prepare Health Informatics students to become competent professionals capable of driving digital transformation in healthcare.
Course Outcomes	<ul style="list-style-type: none"> • Develop healthcare informatics solutions that align with industry standards and regulatory requirements. • Apply health informatics methods to clinical workflows and care processes. • Understand the practical health IT deliverable that meets local requirements and best industry practices. • Analyze the data quality, privacy & governance and communicate findings to stakeholders • Exhibit improved professional skills including communication, teamwork, adaptability, and workplace ethics

Internship (In-House/External):

The 270-hour Internship in either in-house settings (university hospitals, campus clinical units, or university labs) or external placements (partner hospitals, health-IT companies, or public health organizations) gives M.Sc. Health Informatics students a supervised, practice-based exposure to real-world health information systems, clinical workflows and data projects. Students will apply classroom theory to tasks such as electronic medical record implementation/support, health data collection and quality assurance, basic analytics and visualization, usability/workflow review, and/or small applied projects that improve departmental processes or addresses a local need. The internship is structured to strengthen technical, analytical and professional competencies and to prepare students to support digital transformation in healthcare. The Internship emphasizes standards, privacy and governance while developing communication, teamwork and workplace ethics. Students are assessed through supervisor evaluation, a reflective daily logbook, the final Internship report and an oral presentation.

The internship's learning and course outcomes are aligned with the program goals to produce job-ready informatics professionals capable of designing practical, standards-based solutions and communicating findings to stakeholders.

Scheme of University Examination Theory for PG Program:

General structure / patterns for setting up question papers for Theory / Practical courses, their evaluation weightages for PG programs of MGMSBS are given in the following tables

Marks scheme for the University exam:

Final theory marks will be 100 marks (80 marks University Theory exam + 20 Marks Internal assessment).

Question		Marks distribution	Marks allotted per section	Marks
Sec: A	VSAQ	5/6 x 2 M = 10	10	10
Sec: B	SAQ	3/4 x 5 M = 15	15	35
Sec: B	LAQ	2/3 x 10 M = 10	20	
Sec: C	SAQ	3/4 x 5 M = 15	15	35
Sec: C	LAQ	2/3 x 10 M = 10	20	
Total				80 Marks

Practical exam pattern: Total 40 marks with following breakup

Exercise	Description	Marks
Q No (1-4)	Implementation (Code functionality structure and readability etc.)	4x5=20 M
Q No 5	Conceptual Understanding (Fundamental Principles and application knowledge etc.)	1x5=05 M
Q No 6	Problem Solving Skills (Logical thinking, debugging and troubleshooting etc.)	1x5=05 M
Q No 7	Documentation and Presentation / VIVA (Code documentation and explanation)	10 M
Total		40 Marks

Practical to be conducted at respective departments and marks submitted jointly by the parent department to the university.

Breakup of theory IA calculation for 20 marks

Description	Marks
Internal exam (at department)	15 marks
Seminar	5 marks
Total	20 Marks

Breakup of practical IA calculation:

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Journal	5 marks
Total	20 Marks

Note –20 marks to be converted to 10 marks weightage for submission to the university.

Semester III – Dissertation (PG) (Internal Assessment)

Dissertation/Project Proposal: overall performance of the student	Marks allotted	Marks Obtained
Open mindedness/ Receptivity to feedback Integrates feedback	5 Marks	
Meets deadlines / Regularity in meeting / Consistency in communication	10 Marks	
Continuous Internal evaluation (CIE)		
Interest shown in selecting topic	5 marks	
Appropriate review	10 marks	
Discussion with guide and other faculty	10 marks	
Quality of protocol	5marks	
Preparation of proforma / log book / daily reports	5marks	
TOTAL	Out of 50	

Semester IV - Evaluation parameter (Research Project / Dissertation)

Evaluation parameter (Semester IV)	Continuous Internal Evaluation (CIE)	Semester End Evaluation (SEE)	
	Guide	Internal examiner	External examiner
Thesis preparation, Novelty, Overall Lab Work Culture	25	-	-
Dissertation/Project work book	25	25	25
Evaluation of thesis including Viva Voce	-	50	50
Total	50	75	75
Overall Total = 200			

Semester IV - Evaluation of the MHIMT 121: Internship

Name of the student: _____

Date: _____

Name of the Faculty/ Observer: _____

Final Evaluation

1. Technical Knowledge & Application (1-10): _____
 2. Problem-Solving & Critical Thinking (1-5): _____
 3. Communication & Teamwork (1-5): _____
 4. Professionalism & Punctuality (1-5): _____
 5. Quality of Log Book Maintenance (1-5): _____
 6. Learning Outcome & Skill Development (1-5): _____
 7. Final Internship Report Quality (1-5): _____
 8. Student's Initiative & Engagement (1-5): _____
 9. Overall Performance (1-5): _____
 10. Total: _____
 11. **Final Comments:**
-

Evaluator Signature & Date: _____



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.: 022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

Department of Health Informatics

Internship Logbook

MASTER IN HEALTH INFORMATICS

STUDENT NAME: _____

PRN NUMBER: _____

BATCH: _____

SEMESTER: _____

PERIOD FROM: _____ **TO** _____

COORDINATOR

HOD

DIRECTOR



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.: 022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

AIM:

To provide a structured learning experience that enhances students' technical, analytical, and professional skills while addressing the evolving needs of healthcare organizations. By integrating academic knowledge with hands-on practice, these internships prepare Health Informatics students to become competent professionals capable of driving digital transformation in healthcare.

Guidelines:

1. The internship shall commence after the student has completed and passed all subjects up to Semester III
2. The internship is compulsory
3. The duration of the internship shall be 270 Hours.
4. Activities carried out by the student during the internship must be clearly mentioned.

Evaluation of Internees:

Formative Evaluation: The continuous assessment of interns during their internship should be conducted by the Head of the Department, assigned faculty, or a designated individual from the organization (in the case of industry-based internships). The primary objective of this evaluation is to ensure that interns develop the necessary competencies to function effectively in real-world scenarios. This can be facilitated through the maintenance of records or a logbook by all interns. Such documentation serves as tangible evidence of the training process and, more importantly, reflects the intern's progression in acquiring the required competencies for professional performance.

Summative Evaluation: It will be based on the observations of the assigned person from the Department/Organization and record/logbook maintained by the intern.

Based on this two evaluations, the Head of the Department shall issue certificate of satisfactory completion of the training.



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.: 022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

DEPARTMENT OF HEALTH INFORMATICS

Internship Completion Certificate

Class: _____

Year: _____

This is to certify that _____, bearing PRN _____, has successfully completed the internship at _____ from _____ to _____. During this period, the student has completed a total of **270 hours** of internship, as per the university guidelines.

The student demonstrated a high level of professionalism, technical competence, and problem-solving skills.

We wish him/her success in his/her future endeavours.

Head of the Department
Dept. of Health Informatics
MGMSBS, MGMIHS

Director
MGMSBS
Kamothe, Navi Mumbai

Weekly Summary Report

Week: _____

Total Hours Completed This Week: _____

Key Activities Performed:

Challenges Faced & How They Were Addressed:

New Skills Acquired:

Comments by Internship Supervisor:

Date/Day	Task & Activities	Skill gained	Hours Completed	Supervisor Signature



MGM SCHOOL OF BIOMEDICAL SCIENCES

(A constituent unit of MGM INSTITUTE OF HEALTH SCIENCES)

(Deemed to be University u/s 3 of UGC Act 1956)

Grade "A⁺⁺" Accredited by NAAC

Sector 1, Kamothe, Navi Mumbai-410209, Tel.No.: 022-2743763, 27437632, 27432890

Email. sbsnm@mgmuhs.com/ Website: www.mgmsbsnm.edu.in

Final Evaluation (50 Marks)

1. Technical Knowledge & Application (10 marks): _____
2. Problem-Solving & Critical Thinking (5 marks): _____
3. Communication & Teamwork (5 marks): _____
4. Professionalism & Punctuality (5 marks): _____
5. Quality of Log Book Maintenance (5 marks): _____
6. Learning Outcome & Skill Development (5 marks): _____
7. Final Internship Report Quality (5 marks): _____
8. Student's Initiative & Engagement (5 marks): _____
9. Overall Performance (5 marks): _____
10. Total: _____
11. **Final Remark:**

Sign of Internal Examiner: _____

Sign of External Examiner: _____



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A++' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410209

Tel 022-27432471, 022-27432994, Fax 022-27431094

E-mail- registrar@mgmuhs.com

Website: www.mgmuhs.com

