



Curriculum Structure & Detailed Syllabus
Master of Science
(Digital Healthcare Systems & Management)
(Two-Year Post-Graduate Program)

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Approval History

ACM#	Date	Resolutions
SU-6	01/08/2026	The curriculum structure and complete detailed syllabus of M.Sc. (DHSM) recommended by the Board of Studies with the improvements suggested by the Academic Council was approved.

Program Outcomes

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level.

- PO1. Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
- PO2. Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
- PO3. Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
- PO4. Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
- PO5. Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
- PO6. Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
- PO7. Work with professional context with intellectual integrity, ethics and social responsibility.
- PO8. Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
- PO9. Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
- PO10. Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Program Specific Outcomes (PSOs)

- PSO1. Acquire specialized knowledge and skills in digital health systems, healthcare IT implementation, analytics, and healthcare systems & data management practices.
- PSO2. Implement the skills in healthcare information systems, digital healthcare operations, and healthcare data analytics to support healthcare organizations.
- PSO3. Utilize the expertise in digital healthcare systems, technology platforms, and operational management to build careers in hospitals, health-tech companies, and consulting organizations.

Program Educational Objectives (PEOs)

- PEO1. Build a successful career in digital healthcare systems, healthcare management, and healthcare technology sectors.
- PEO2. Work independently or in a diverse team with effective communication in interdisciplinary environment, and demonstrate leadership in industry and academia.
- PEO3. Engage in lifelong learning and career development through analysis, discussion, professional studies, literature study, and continued research.

Course Categories & Definitions

L	Lecture
T	Tutorial
P	Practical / Laboratory / Sessional
WCH	Weekly Contact Hours
UCR	University Core Course
UMC	University Mandatory Course (0-Credit)
PCR	Program Core Course
PEL	Program Elective Course
OEL	Open Elective Course
HNS	Honours (Choice-based) Course
MNR	Minor (Choice-based) Course
OOO	Open Online Course (on NPTEL / Swayam / Other)
INT	Summer Internship
PSI	Practice School / Industry Internship
PRJ	Project Work
SEC	Skill Enhancement Course
VAC	Value Addition Course

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Part I

Curriculum Structure

Curriculum Structure

Semester I								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
PCR	DH5001	Modern Healthcare Ecosystem	3	0	0	3	0	0
PCR	DH5002	Healthcare Workflows & Operations	3	1	0	3	1	0
PCR	DH5003	Digital Healthcare Systems	3	0	0	3	0	0
PCR	DH5004	Healthcare Data Standards & Coding	3	0	0	3	0	0
PCR	DH5005	Digital Systems Budgeting & ROI	3	0	0	3	0	0
PRACTICAL								
PCR	DH5006	Healthcare Workflows & Operations Lab	0	0	4	0	0	2
PCR	DH5007	Digital Healthcare Systems Lab	0	0	4	0	0	2
PCR	DH5008	Healthcare Data Standards & Coding Lab	0	0	2	0	0	1
		SUB-TOTAL	15	1	10	15	1	5
		TOTAL	26			21		

Semester II								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
PCR	DH5009	Solution Architecture & Interoperability	3	0	0	3	0	0
PCR	DH5010	Healthcare Performance Intelligence	3	1	0	3	1	0
PCR	DH5011	AI in Healthcare Systems	3	0	0	3	0	0
PEL		Program Elective - I	3	0	0	3	0	0
PEL		Program Elective - II	3	0	0	3	0	0
PRACTICAL								
PCR	DH5012	Healthcare Performance Intelligence Lab	0	0	4	0	0	2
PCR	DH5013	AI in Healthcare Systems Lab	0	0	2	0	0	1
PCR	DH5014	Health Systems Integration Lab	0	0	4	0	0	2
SEC	HS5003	Communication & Soft Skills	0	0	2	0	0	1
		SUB-TOTAL	15	1	12	15	1	6
		TOTAL	28			22		

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Semester III								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
PCR	DH6001	Digital Transformation in Healthcare	3	0	0	3	0	0
PCR	DH6009	Healthcare Data Privacy & Cybersecurity	3	0	0	3	0	0
PEL		Program Elective - III	3	0	0	3	0	0
PEL		Program Elective - IV	3	0	0	3	0	0
PRACTICAL								
PCR	DH6003	Hospital Digital Maturity Assessment Lab	0	0	4	0	0	2
PCR	DH6004	Digital Healthcare Operations & Quality Lab	0	0	4	0	0	2
PRJ	IP4003	Capstone Project	0	0	10	0	0	5
INT	IP4001	Summer Internship	0	0	0	0	0	1
		SUB-TOTAL	12	0	18	12	0	10
		TOTAL	30			22		

Semester IV								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
OOC	DH6005	MOOC	0	0	0	3	0	0
PRACTICAL								
PRJ/PSI	IP4002	Project Work / Industry Internship	0	0	24	0	0	12
VAC	VA0001	Yoga / NSS / NCC / PES / CPA	0	0	2	0	0	0
		SUB-TOTAL	0	0	26	3	0	12
		TOTAL	26			15		

		GRAND TOTAL (4 SEMESTERS)	110			80		
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Note:

1. Courses offered under each elective are given in “List of Electives” on Page 4.
2. MOOC - Massive Open Online Course (on NPTEL / Swayam / Other).
3. Approved list of courses for MOOC (self study) shall be published by the department. Students are advised to complete the same before the end of 4th semester.
4. Students opting for Project Work shall undergo the same under the guidance of a faculty member.
5. Students selected for Industry Internship shall be attached to a faculty member as mentor.
6. Value Addition Courses: Yoga - Yoga & Meditation, NSS - National Service Scheme, NCC - National Cadet Corps, PES - Physical Education & Sports, CPA - Creative & Performing Arts. Every student must invest at least 2 hours per week in the chosen course in one semester.
7. The VAC Course may be assigned in a different semester depending on available capacity.

List of Electives

Code	Elective # and Subjects
<i>Program Elective-I</i>	
DH5015	System Selection & RFP Process
DH5016	Digitally Enabled Hospital Operations
DH5017	Healthcare Quality Management Systems
<i>Program Elective-II</i>	
DH5018	Systems Integration in Healthcare
DH5019	Digital Health Product Management
DH5020	Patient Safety & Risk Management
<i>Program Elective-III</i>	
DH6006	HIS/EMR Implementation Lifecycle
DH6007	Revenue Cycle Management
DH6008	Quality Accreditation & Digital Compliance
<i>Program Elective-IV</i>	
DH6002	Technology Innovation in Healthcare
DH6010	Smart Hospitals & IoT Applications
DH6011	Healthcare Outcomes & Value-Based Care

Note:

1. The department shall offer subjects under each program elective depending on available capacity.
2. Unless adequate number of students choose an elective subject offered by the department, the subject shall not be offered and the students shall be assigned with a different elective subject.

Part II

Detailed Syllabus

Category	Code	Modern Healthcare Ecosystem	L-T-P	Credits	Marks
PCR	DH5001		3-0-0	3	100

Objectives	The course aims to provide students with a comprehensive understanding of the structure, functioning, and dynamics of the healthcare ecosystem in India including delivery models, financing mechanisms, regulatory frameworks, and digital health initiatives.
Pre-Requisites	Basic understanding of healthcare systems, management principles, or public health concepts is desirable.
Teaching Scheme	Regular classroom lectures with use of ICT tools; sessions will be interactive with case studies, real-world scenarios, policy discussions, and industry examples.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Definition and components of healthcare ecosystem, Types of healthcare delivery models (public, private, PPP), Levels of care (primary, secondary, tertiary), Structure of healthcare delivery in India, Key healthcare indicators, Role of Government and private sector; Overview of global healthcare systems for comparison.	8 Hours
Module-2	Healthcare Systems: Public Healthcare System – Sub-centres, PHCs, CHCs, District Hospitals, National Health Mission (NHM), Urban vs rural healthcare delivery; Private Healthcare System – Corporate hospitals, Clinics, Diagnostic centres; Role of NGOs and charitable institutions, Referral systems and patient pathways; Emerging Models – Daycare centres, Telemedicine, Home healthcare, Digital clinics.	10 Hours
Module-3	Healthcare Financing Models: Out-of-pocket expenditure, Government funding, Insurance-based systems; Health Insurance in India – Public schemes (Ayushman Bharat), Private insurance, TPAs, Claims process and reimbursement models.	7 Hours
Module-4	Regulatory Framework: Accreditation standards; Quality frameworks; Digital Health Initiatives – ABDM (Ayushman Bharat Digital Mission); Data Governance – Overview of data privacy and security in healthcare.	10 Hours
Module-5	Key Stakeholders: Patients, Providers, Payers, Regulators, Technology vendors, Pharma and device companies; Healthcare Value Chain – End-to-end flow from patient registration to care delivery and follow-up.	7 Hours
Total		42 Hours

Text Books:

- T1. S. S. Lee and A. N. Berman, *Healthcare Systems: A Global Perspective*, 2nd Edition, Wiley India, 2018.
- T2. A. S. Pande and R. K. Gupta, *Healthcare Management in India*, 1st Edition, McGraw-Hill Education, 2020.

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Reference Books:

- R1. S. Shortell and A. Kaluzny, *Healthcare Management: Organization Design and Behavior*, 7th Edition, Cengage Learning, 2024.
- R2. K. Park, *Park's Textbook of Preventive and Social Medicine*, 27th Edition, Banarsidas Bhanot, 2023.

Online Resources:

1. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10292032/>: by National Library of Medicine
2. https://www.researchgate.net/publication/394085257_The_Health_Care_System_in_India: by Prof. S. Ghosh, Tata Institute of Social Sciences
3. <https://www.ey.com/content/dam/ey-unified-site/ey-com/en-in/industries/health/images/ey-decoding-india-s-healthcare-landscape.pdf>: by S. S. Sundaram, EY LLP

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the structure and components of the healthcare ecosystem in India.
CO2	Explain the functioning of public and private healthcare delivery systems.
CO3	Analyze healthcare financing, insurance models, and revenue cycle mechanisms.
CO4	Evaluate healthcare policies, regulatory frameworks, and digital health initiatives.
CO5	Assess the roles of stakeholders and emerging trends in the healthcare industry.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1				2	3	2	2		2	3	1	1
CO2	3				1	2	2	2		2	3	2	1
CO3	2				2	3	2	3		3	1	1	1
CO4	2				1	1	2	2		3	2	1	1
CO5	3				1	2	3	2		2	2	1	1

Category	Code	Healthcare Workflow & Operations	L-T-P	Credits	Marks
PCR	DH5002		3-1-0	4	100

Objectives	The objective of this course is to provide a comprehensive understanding of patient journey mapping, operational processes, efficiency improvement, and the role of digital systems in optimizing healthcare service delivery.
Pre-Requisites	Basic understanding of process definition and flowchart creation is required.
Teaching Scheme	Regular classroom lectures supported by ICT tools, case studies, workflow simulations, and real-world hospital operational scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Patient Journey & Workflow Mapping: Entry points into healthcare system, Patient journey from registration to discharge, Touchpoints across departments; Workflow Mapping Techniques – Flowcharts, Swim lane diagrams, Process mapping tools, Identification of bottlenecks and inefficiencies; Care Continuum – Preventive, Curative, Rehabilitative, and Follow-up care pathways; Referral Systems – Inter-department and inter-facility referrals, Continuity of care.	10 Hours
Module-2	Clinical Operations Management: OPD Operations – Registration, Consultation workflows, Appointment systems, Scheduling optimization; IPD Operations – Admission, Bed allocation, Inpatient care workflow, Discharge processes; Emergency Department – Ambulance Management, Triage systems, Emergency workflow management, Critical care coordination; ICU & Specialty Units – Workflow complexities in critical care environments; Clinical Documentation – EMR-based documentation, Standard treatment protocols; Care Coordination – Multidisciplinary coordination mechanisms.	12 Hours
Module-3	Diagnostics & Support Service Operations: Laboratory Workflow – Sample collection, Processing, Reporting, Turnaround time (TAT) optimization; Radiology Workflow – Scheduling, Imaging, Reporting, PACS integration; Pharmacy Operations – Prescription management, Dispensing workflow, Inventory control; Blood Bank Operations – Storage, Cross-matching, Supply chain processes; Support Services – Housekeeping, Biomedical waste management, Facility operations; Interdepartmental Coordination – Integration for seamless patient care delivery.	12 Hours
Module-4	Operational Metrics & Process Optimization: Operational KPIs – Patient waiting time, Bed occupancy rate, ALOS, TAT, Throughput; Capacity Planning – Resource allocation, Staff optimization, Demand forecasting; Process Optimization Techniques – Lean healthcare, Six Sigma, Process redesign; Queue Management – Patient flow optimization models, Digital queue systems; Performance Monitoring – Dashboards, Real-time monitoring, BI tools; Quality Improvement – Continuous quality improvement frameworks.	12 Hours

Cont'd...

Module-#	Topics	Hours
Module-5	Digitalized Healthcare Operations: Digital Workflow Systems – HIS/EMR-driven workflows, Automation of processes; Smart Scheduling Systems – Digital appointment and queue systems; Automation Tools – E-prescription, E-discharge summaries, Workflow automation; ABDM Integration – Workflow integration with ABHA, Data exchange; Patient Engagement – Mobile apps, Portals, Teleconsultation workflows; Future Trends – AI-driven operations, Predictive analytics, Smart hospitals.	10 Hours
Total		56 Hours

Text Books:

- T1. S. Shortell and A. Kaluzny, *Healthcare Management: Organization Design and Behavior*, 7th Edition, Cengage Learning, 2024.
- T2. R. C. McLaughlin and C. D. Kaluzny, *Continuous Quality Improvement in Health Care*, 5th Edition, Jones & Bartlett, 2013.

Reference Books:

- R1. L. C. Gapenski and G. H. Pink, *Understanding Healthcare Financial Management*, 5th Edition, Health Administration Press, 2006.
- R2. K. Park, *Park's Textbook of Preventive and Social Medicine*, 27th Edition, Banarsidas Bhanot, 2023.

Online Resources:

- <https://curogram.com/blog/healthcare-workflow-automation>: by A. Amoroso
- <https://pmc.ncbi.nlm.nih.gov/articles/PMC8318703/>: by Cabán, Haque, and Kemper
- Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe patient journey and healthcare workflow processes across hospital settings.
CO2	Explain clinical and non-clinical operational workflows in healthcare organizations.
CO3	Analyze diagnostic and support service workflows for operational efficiency.
CO4	Evaluate operational performance using KPIs and process optimization techniques.
CO5	Apply digital tools and technologies to improve healthcare workflow efficiency.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.

Cont'd...

PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	3		2	1	2	3	2	2
CO2	3	2	1	2	2	3		3	1	3	3	2	2
CO3	2	1	1	2	2	2		2	2	3	3	1	1
CO4	2	1	1	1	1	2		2	1	2	2	1	1
CO5	1	1	1	2	1	2		2	1	2	2	1	1

Category	Code	Digital Healthcare Systems	L-T-P	Credits	Marks
PCR	DH5003		3-0-0	3	100

Objectives	The course aims to provide an understanding of digital healthcare systems, their architecture, components, and implementation in modern healthcare environments, focusing on HIS, EMR, interoperability, and digital health platforms.
Pre-Requisites	Basic understanding of healthcare systems and IT concepts is desirable.
Teaching Scheme	Regular classroom lectures supported by ICT tools, case studies, system demonstrations, and real-world digital health implementations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Digital Health Overview: Evolution of digital health, Need for digital transformation in healthcare, Global vs Indian perspective; Components of Digital Health Systems – Clinical, Administrative, and Financial systems; Hospital Information Systems (HIS) – Core modules and functionalities; Electronic Medical Records (EMR/EHR) – Structure, Data elements, Clinical documentation.	8 Hours
Module-2	System Architecture: Centralized vs distributed systems, Cloud-based healthcare systems; Infrastructure Components – Servers, Storage, Networking, Virtualization; Cloud Computing in Healthcare – SaaS, PaaS, IaaS models, Scalability and cost benefits; Disaster Recovery & Business Continuity – Backup systems, Failover mechanisms.	10 Hours
Module-3	Interoperability Concepts: Semantic, Syntactic, and Organizational interoperability; Standards – HL7, FHIR, DICOM, APIs; Health Information Exchange (HIE); ABDM Framework – ABHA, HFR, HPR, Unified Health Interface (UHI); Integration Challenges – System compatibility, Governance issues.	10 Hours
Module-4	Telemedicine Systems: Workflow, Platforms, Regulations; Mobile Health (mHealth) – Apps, Wearables, Patient engagement tools; Clinical Decision Support Systems (CDSS) – Alerts, Recommendations, AI-assisted diagnosis; E-Pharmacy & Digital Labs – Integration with healthcare systems; Patient Portals – Engagement, access to records, communication tools.	8 Hours
Module-5	AI & Machine Learning: Predictive analytics, Diagnostics; Internet of Medical Things (IoMT) – Remote monitoring systems; Blockchain in Healthcare – Secure data exchange, Consent management; Big Data & Analytics – Data-driven healthcare decisions; Future Trends – Smart hospitals, Digital twins, Precision healthcare.	6 Hours
Total		42 Hours

Text Books:

- T1. H. M. Raghupathi and W. Tan, *Healthcare Informatics: Improving Efficiency and Productivity*, 1st Edition, CRC Press, 2015.
- T2. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, 1st Edition, IOS Press, 2020.

Reference Books:

- R1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- R2. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

Online Resources:

1. <https://www.infosys.com/digital/white-papers/documents/digital-healthcare-ecosystem.pdf>: by U. K. Kotla and G. Jain
2. <https://www.weforum.org/publications/a-new-era-for-digital-health-abu-dhabi-s-leap-to-health-intelligence/>: Abu Dhabi's Leap to Health Intelligence
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the architecture and components of digital healthcare systems.
CO2	Explain healthcare IT infrastructure and system architecture.
CO3	Analyze interoperability standards and health information exchange frameworks.
CO4	Evaluate digital health platforms and their applications in healthcare delivery.
CO5	Assess emerging technologies and their impact on healthcare systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	3		3	2	2	3	2	1
CO2	2	2	1	1	1	1		2	1	3	2	1	1
CO3	3	3	1	3	2	3		3	2	2	3	1	1
CO4	2	2	1	2	2	3		3	2	2	3	2	2
CO5	2	1	1	2	1	2		2	1	2	2	1	1

Category	Code	Healthcare Data Standards & Coding	L-T-P	Credits	Marks
PCR	DH5004		3-0-0	3	100

Objectives	This course aims to provide comprehensive knowledge of healthcare data standards, clinical coding systems, and structured data management focusing on standardization, interoperability, coding practices, and regulatory compliance.
Pre-Requisites	Basic understanding of healthcare systems and data concepts is desirable.
Teaching Scheme	Regular classroom lectures supported by ICT tools, case studies, coding exercises, and real-world healthcare data scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Healthcare Data Types: Clinical, Administrative, Financial, and Operational data; Need for Standardization – Importance of structured data; Data Standards Overview – Concepts of data standardization and normalization; Healthcare Data Lifecycle – Data capture, Storage, Processing, and Usage.	8 Hours
Module-2	ICD Coding: ICD-10 and ICD-11 classification systems; Procedure Coding – CPT and procedure classification systems; DRG Systems – Diagnosis related groups and hospital reimbursement models; Coding Practices – Clinical documentation improvement (CDI), Coding accuracy and Use cases.	8 Hours
Module-3	HL7 Standards: Messaging standards and structure; FHIR Framework – Resource-based data exchange; SNOMED CT – Clinical terminology systems; LOINC – Laboratory data standardization; DICOM – Imaging data standards; Terminology Mapping – Integration of multiple standards.	8 Hours
Module-4	Data Quality: Accuracy, Completeness, Consistency, and Reliability; Data Governance – Policies, Roles, and Responsibilities; Master Data Management – Patient identity management; Interoperability Models – Data exchange frameworks and APIs; ABDM Integration – Health data exchange, ABHA-linked systems; Challenges: Data silos, Fragmentation, Standardization issues.	10 Hours
Module-5	Regulatory Frameworks: NABH digital standards and compliance requirements; Data Privacy – Digital Personal Data Protection (DPDP) Act; Security Measures – Encryption, Access control, Audit trails; Ethical Considerations – Patient consent, Data ownership; Healthcare Data Risks – Breaches, Misuse, and Mitigation strategies.	8 Hours
Total		42 Hours

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

P.T.O

Reference Books:

- R1. P. K. Oachs and L. M. Delhomme, *Health Information Management: Concepts, Principles and Practice*, 7th Edition, AHIMA, 2025.
- R2. M. Abdelhak and M. A. Hanken, *Health Information: Management of a Strategic Resource*, 5th Edition, Springer, 2014.

Online Resources:

1. <https://www.ncbi.nlm.nih.gov/books/NBK543525/>: by S. Schulz, R. Stegwee, and C. Chronaki
2. <https://www.chcf.org/wp-content/uploads/2017/12/PDF-ClinicalDataStandardsInHealthCare.pdf>: by K. Kim for California Healthcare Foundation
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe healthcare data types and the importance of standardization.
CO2	Apply clinical coding systems for healthcare documentation and billing.
CO3	Analyze healthcare data standards and terminology systems.
CO4	Evaluate data governance, quality, and interoperability frameworks.
CO5	Assess regulatory compliance, data privacy, and security requirements.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	2		2	1	2	3	1	1
CO2	2	2	1	2	1	2		2	1	2	3	2	2
CO3	3	2	1	3	2	3		3	2	2	3	2	1
CO4	2	1	1	2	1	2		1	1	1	2	1	1
CO5	2	2	1	2	1	1		1	1	1	2	1	1

Category	Code	Digital Systems Budgeting & ROI	L-T-P	Credits	Marks
PCR	DH5005		3-0-0	3	100

Objectives	This course aims to develop an understanding of financial planning, budgeting, and return on investment (ROI) in the context of digital healthcare systems. The course focuses on evaluating digital investments, cost structures, financial decision-making, and value realization from healthcare IT implementations.
Pre-Requisites	Fundamentals of financial concepts is desirable.
Teaching Scheme	Lectures supported by ICT tools, case studies, financial modeling exercises, and real-world healthcare IT investment scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Digital Transformation Economics: Economic drivers of digital transformation in healthcare, Cost of inefficiencies in traditional systems, Value of digitization, Cost structure of Digital Health Systems, Value drivers of Digital Transformation, Financial Impact of Digital Systems – Cost savings through automation, Reduction in errors, Efficiency gains in operations, Impact on revenue cycle.	8 Hours
Module-2	Budgeting Concepts: Capital budgeting vs operational budgeting; IT Budgeting – Planning for HIS, EMR, infrastructure and Digital Platforms; CAPEX vs OPEX Models – On-premise vs Cloud-based healthcare systems; Budget Planning Process – Forecasting, Allocation, and Monitoring; Cost Components – Hardware, Software, Implementation, Training, Maintenance.	10 Hours
Module-3	Investment Appraisal Techniques: ROI, NPV, IRR, Payback period; Cost-Benefit Analysis – Tangible vs intangible benefits; Value Realization – Clinical, Operational, and Financial benefits of Digital Systems; Risk Assessment – Financial risks in IT investments; Case Studies – ROI evaluation of HIS/EMR implementation.	8 Hours
Module-4	Digital Investment Strategy: Aligning IT investments with hospital strategy, Phased investment planning and roadmap-based budgeting, Lifecycle costing of digital systems (HIS, EMR, Analytics Platforms), Hidden costs (integration, training, upgrades, downtime), Measuring realized vs expected benefits, Linking digital investments to clinical, operational, and financial outcomes.	8 Hours
Module-5	Financial Impact of Digital Transformation: Operational Efficiency Gains, Cost reduction, Productivity improvement; Revenue Enhancement – Improved billing, Reduced leakage, Better utilization; Quality & Outcome Impact – Reduced errors, Improved patient satisfaction; Digital Maturity Models – Financial impact across maturity levels; Future Trends – Value-based healthcare, Outcome-driven financing.	8 Hours
Total		42 Hours

Text Books:

- T1. L. C. Gapenski and G. H. Pink, *Understanding Healthcare Financial Management*, 5th Edition, Health Administration Press, 2006.

T2. J. J. Baker, R. W. Baker, and N. R. Dworkin, *Health Care Finance: Basic Tools for Nonfinancial Managers*, 5th Edition, Jones & Bartlett Learning, 2017.

Reference Books:

- R1. S. A. Finkler, D. L. Smith, and T. D. Calabrese, *Financial Management for Public, Health, and Not-for-Profit Organizations*, 6th Edition, CQ Press, 2019.
 R2. W. N. Zelman, M. J. McCue, N. D. Glick, and M. S. Thomas, *Financial Management of Health Care Organizations*, 4th Edition, Jossey-Bass, 2020.

Online Resources:

1. <https://millipixels.com/blog/digital-transformation-strategy>: Driving ROI
2. <https://www.pwc.com/sg/en/publications/assets/digital-health-roi-2017.pdf>: Measuring ROI
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe healthcare financial structures and cost components.
CO2	Evaluate financial and operational impact of digital transformation initiatives.
CO3	Analyze benefit realization of digital transformation of healthcare.
CO4	Apply financial evaluation techniques for healthcare IT investments.
CO5	Develop budgeting plans for digital healthcare systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	1	1	2	1	1	3	2	1	1	3	2	2
CO2	3	2	1	1	1	2	2	2	1	2	3	2	1
CO3	3	2	2	2	2	2	3	2	2	2	3	1	1
CO4	2	1	1	1	1	2	2	1	2	1	2	1	1
CO5	3	2	3	3	2	3	3	3	1	2	3	2	1

Category	Code	Healthcare Workflow & Operations Lab	L-T-P	Credits	Marks
PCR	DH5006		0-0-4	2	100

Objectives	The objective of this laboratory course is to provide hands-on understanding of healthcare workflows, patient journeys, and operational processes. The students will learn to map, analyze, and optimize healthcare workflows using practical tools and real-world scenarios.
Pre-Requisites	Basic understanding of healthcare systems, computer applications, and data handling is desirable.
Teaching Scheme	Regular laboratory sessions with simulations and case-based exercises conducted under the supervision of the teacher using digital tools, healthcare platforms, and real-world datasets.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Introduction to healthcare workflows and patient journey mapping.
3-4	Mapping OPD workflow using flowcharts and swimlane diagrams.
5-6	Mapping IPD workflow: admission, bed allocation, discharge.
7-8	Emergency workflow simulation and triage process mapping.
9-10	ICU workflow and care coordination simulation.
11-12	Diagnostic workflow mapping: lab and radiology processes.
13-14	Pharmacy workflow: prescription to dispensing.
15-16	Patient flow analysis and identification of bottlenecks.
17-18	Measurement of operational KPIs (waiting time, TAT, ALOS).
19-20	Bed management and capacity utilization exercise.
21-22	Queue management and scheduling optimization exercise.
23-24	Workflow redesign using Lean principles.
25-26	Case study: High-volume hospital workflow optimization.
27-28	Mini project: End-to-end workflow design for a hospital department.

Text Books:

- T1. H. M. Raghupathi and W. Tan, *Healthcare Informatics: Improving Efficiency and Productivity*, 1st Edition, CRC Press, 2015.
- T2. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.

Reference Books:

- R1. K. A. Kuhn, *Medical Informatics: Practical Guide for Healthcare and IT Professionals*, Springer, 2018.
- R2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

Online Resources:

1. <https://curogram.com/blog/healthcare-workflow-automation>: 35 Game-Changing Examples of Healthcare Workflow Automation to Revolutionize Patient Care, Alvin Amoroso
2. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8318703/>: Identifying Opportunities for Workflow Automation in Health Care: Lessons Learned from Other Industries

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Demonstrate healthcare workflow mapping using structured tools.
CO2	Analyze patient journey and identify operational inefficiencies.
CO3	Apply workflow optimization techniques in healthcare settings.
CO4	Evaluate operational performance using healthcare KPIs.
CO5	Design improved workflows for healthcare processes.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	1			1	2	1	1	1
CO2	3	2	1	3	2	2			1	2	2	2	1
CO3	2	3	2	2	3	2			2	2	2	2	1
CO4	2	2	2	2	3	2	2		2	3	2	2	2
CO5	2	2	3	2	3	2	2		3	3	2	3	2

Category	Code	Digital Healthcare Systems Lab	L-T-P	Credits	Marks
PCR	DH5007		0-0-4	2	100

Objectives	The objective of this laboratory course is to provide hands-on exposure to digital healthcare systems, including HIS, EMR, interoperability frameworks, and digital health platforms.
Pre-Requisites	Basic understanding of healthcare systems and IT concepts is required.
Teaching Scheme	Laboratory sessions involving system simulations, demonstrations of healthcare IT platforms, hands-on exercises with datasets, and case-based learning.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Digital Health Systems and Overview of Hospital Information Systems (HIS).
3-4	Understanding patient registration, appointment scheduling, and OPD workflow using simulated HIS.
5-6	Electronic Medical Records (EMR): Creation, documentation, and clinical data entry.
7-8	Digital IPD workflow: Admission, bed management, discharge process simulation.
9-10	Laboratory Information System (LIS) and Radiology Information System (RIS) workflow demonstration.
11-12	Pharmacy information system and medication management process.
13-14	Introduction to healthcare data analytics tools (Excel / Power BI) and basic healthcare dataset analysis.
15-16	Development of healthcare dashboards (OPD, revenue, patient flow).
17-18	Understanding interoperability concepts: HL7, FHIR (case-based exercises).
19-20	Digital health ecosystem: ABDM workflow simulation (ABHA, patient data exchange concepts).
21-22	Healthcare revenue cycle management: Billing and insurance workflow simulation.
23-24	Data privacy and security basics in healthcare systems (case scenarios).
25-26	Telemedicine workflow simulation and digital consultation models.
27-28	Mini project: Design a digital transformation plan for a hospital department.

Text Books:

- T1. H. M. Raghupathi and W. Tan, *Healthcare Informatics: Improving Efficiency and Productivity*, 1st Edition, CRC Press, 2015.
- T2. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.

Reference Books:

- R1. K. A. Kuhn, *Medical Informatics: Practical Guide for Healthcare and IT Professionals*, Springer, 2018.
- R2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

P.T.O

Online Resources:

1. <https://www.infosys.com/digital/white-papers/documents/digital-healthcare-ecosystem.pdf>: by U. K. Kotla and G. Jain
2. <https://www.weforum.org/publications/a-new-era-for-digital-health-abu-dhabi-s-leap-to-health-intelligence/>: Abu Dhabi's Leap to Health Intelligence

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Demonstrate the use of healthcare information systems and digital workflows.
CO2	Perform various operations in EMR and hospital digital systems.
CO3	Analyze interoperability concepts and healthcare data exchange mechanisms.
CO4	Apply digital health platforms such as ABDM and telemedicine systems.
CO5	Design the architecture for digital healthcare system implementation.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	3		3	1	3			3	2	3
CO2	3	2	1	3		3	1	3		2	3	2	3
CO3	2	1	1	2		2	1	2	1	1	2	1	1
CO4	2	1	1	2		1	1	1		1	1	1	1
CO5	3	2	2	2		2	2	2	2	3	2	1	2

Category	Code	Healthcare Data Standards & Coding Lab	L-T-P	Credits	Marks
PCR	DH5008		0-0-2	1	100

Objectives	The objective of this laboratory course is to provide hands-on experience in healthcare data standardization, clinical coding systems, and interoperability frameworks.
Pre-Requisites	Basic understanding of healthcare systems and data concepts is required.
Teaching Scheme	Regular laboratory sessions involving coding exercises, standard-based data structuring, case studies, and practical exposure to healthcare data formats and interoperability scenarios.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Introduction to healthcare data formats and structured vs unstructured data.
2	ICD-10 coding: Assign diagnosis codes using sample clinical cases.
3	ICD-11 overview and comparison with ICD-10 (case-based exercise).
4	Procedure coding using CPT (basic scenarios).
5	DRG classification and its role in hospital billing (case exercise).
6	SNOMED CT: Clinical terminology mapping for diagnoses and procedures.
7	LOINC: Standardization of laboratory test data.
8	DICOM basics: Understanding imaging data structure (conceptual practical).
9	HL7 message structure: Understanding segments and fields (case-based).
10	FHIR resources: Creating basic patient and observation resources.
11	Mapping between standards (ICD ↔ SNOMED ↔ LOINC).
12	Data quality validation: identifying errors in healthcare datasets.
13	Interoperability scenario: data exchange between hospital systems.
14	Mini project: Standardizing and coding a sample healthcare dataset.

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

Reference Books:

- R1. P. K. Oachs and L. M. Delhomme, *Health Information Management: Concepts, Principles and Practice*, 7th Edition, AHIMA, 2025.
- R2. M. Abdelhak and M. A. Hanken, *Health Information: Management of a Strategic Resource*, 5th Edition, Springer, 2014.

Online Resources:

1. <https://www.cdc.gov/iis/technical-guidance/hl7.html>: HL7 Implementation Guide
2. https://www.nrces.in/download/files/pdf/doc.TechnicalImplementationGuide_Current-en-US_INT_20150131.pdf: - SNOMED CT Technical Implementation Guide, NRCeS

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Apply healthcare coding systems such as ICD and CPT in clinical scenarios.
CO2	Utilize healthcare data standards such as SNOMED, LOINC, and DICOM.
CO3	Interpret healthcare data exchange formats such as HL7 and FHIR.
CO4	Perform data standardization and mapping across multiple coding systems.
CO5	Validate and structure healthcare data for interoperability and compliance.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
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PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	2		2	1	2	1	2	3	2	1
CO2	3	1	1	1		2	1	1	1	2	2	1	1
CO3	2	1	1	1		2	1	2	1	1	2	1	1
CO4	3	2	1	2		3	2	2	1	2	3	2	1
CO5	2	1	1	1		2	1	2	1	2	2	1	1

Category	Code	Solution Architecture & Interoperability	L-T-P	Credits	Marks
PCR	DH5009		3-0-0	3	100

Objectives	The objective of this course is to develop a comprehensive understanding of healthcare solution architecture and interoperability frameworks focusing on system design and integration of healthcare applications.
Pre-Requisites	Understanding of digital healthcare systems, and data standards is required.
Teaching Scheme	Regular classroom lectures supported by system architecture diagrams, case studies, real-world healthcare integration scenarios, and solution design exercises.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Healthcare Solution Architecture: Enterprise Architecture – Concepts, Layers (business, application, data, technology); Ecosystem Architecture – HIS, LIS, RIS, PACS, ERP integration landscape; Architecture Types – Monolithic vs modular vs microservices architecture; Scalability, Performance and Cloud Architecture.	8 Hours
Module-2	Integration in Healthcare Systems: System Integration Concepts – Point-to-point, Middleware, API-based; Integration Engines – Role of integration engines; Integration Scenarios – HIS, LIS, RIS, Pharmacy, Billing; Workflow Orchestration across system; Challenges in Integration.	10 Hours
Module-3	Interoperability Frameworks & Implementation: Interoperability Levels – Foundational, Structural, Semantic interoperability; FHIR in Practice – Resource modeling, RESTful APIs, Real-world use cases; HL7 Messaging Implementation; DICOM Integration; ABDM Architecture Deep Dive.	10 Hours
Module-4	Health Information Exchange (HIE): Centralized vs federated models; Platform-Based Architecture – Digital health platforms and ecosystems; Data Flow Design – Patient data lifecycle across systems; Security in Data Exchange – Authentication, Authorization, Consent frameworks.	8 Hours
Module-5	Scalable Digital Health Architecture: Microservices in Healthcare – Modular system design; Event-Driven Architecture – Real-time healthcare systems; Smart Hospitals – Integrated digital ecosystems; Interoperability at Scale – National-level health systems	6 Hours
Total		42 Hours

Text Books:

- T1. K. A. Kuhn, *Medical Informatics: Practical Guide for Healthcare and IT Professionals*, Springer, 2018.
- T2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

Reference Books:

- R1. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.
- R2. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

Online Resources:

1. https://www.linuxfoundation.org/hubfs/LF%20Research/lfr_healthdata2024_102824a.pdf: Open Architecture for Health Data Interoperability, Anna Hermansen, The Linux Foundation, 2024
2. https://www.medtecheurope.org/wp-content/uploads/2021/10/mte_interoperability_digital_health_white-paper_06oct21.pdf: Interoperability standards in digital health, Medtech Europe, 2021

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain healthcare solution architecture and system design principles.
CO2	Analyze integration approaches across healthcare applications.
CO3	Apply interoperability frameworks such as HL7 and FHIR in system design.
CO4	Design API-based healthcare data exchange architectures.
CO5	Evaluate scalable and future-ready digital health architectures.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3		2	1	2	2	1	1
CO2	3	2	1	2	2	2		2	1	2	3	2	1
CO3	2	2	2	2	2	3		2	2	2	2	1	1
CO4	2	1	1	1	1	1		1	1	1	2	1	1
CO5	2	1	1	1	1	2		2	1	2	2	1	1

Category	Code	Healthcare Performance Intelligence	L-T-P	Credits	Marks
PCR	DH5010		3-1-0	4	100

Objectives	This course aims to develop capabilities in measuring, designing, and improving healthcare performance using data-driven and strategic approaches emphasizing performance intelligence frameworks, strategy alignment, advanced KPI design, analytics interpretation, and decision-support systems.
Pre-Requisites	Knowledge of healthcare workflows, data concepts, and digital systems is required.
Teaching Scheme	Regular classroom lectures supported by case studies, dashboard interpretation, performance analysis scenarios, and healthcare analytics frameworks.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Concept of Performance Intelligence – Reporting vs Analytics vs Intelligence; Healthcare Performance Dimensions – Clinical, Operational, Financial, Patient experience; Data-Driven Decision Making – Role of analytics in healthcare leadership; Performance Measurement Challenges – Data quality, Fragmentation, Delays.	12 Hours
Module-2	Strategic Performance Management: Healthcare Strategy Fundamentals – Vision, Mission, Strategic objectives; Balanced Scorecard – Financial, Patient, Internal processes, Learning and growth; Strategy Mapping – Linking objectives to KPIs; Performance Governance – Cascading Strategy, Organizational, Departmental, Individual KPIs.	12 Hours
Module-3	Healthcare KPIs & Metrics: KPIs – Clinical KPIs, Operational KPIs, Financial KPIs; Patient Experience Metrics – Satisfaction, Engagement; KPI Design Principles – Actionability, Relevance, Measurability.	12 Hours
Module-4	Analytics & Performance Measurement: Types of Analytics – Descriptive, Diagnostic, Predictive; Trend Analysis and Pattern Recognition; Benchmarking – Internal vs External benchmarking; Variance Analysis – Identifying deviations; Root Cause Analysis – Performance gap identification.	10 Hours
Module-5	Healthcare Command Center: Architecture of a Healthcare Command Center, Operational Use Cases, Patient Experience Management, Real-Time Performance Monitoring – Live KPIs and alerts, Event-driven decision systems, Exception-based management; Control Mechanisms – Escalation protocols.	10 Hours
Total		56 Hours

Text Books:

- T1. W. Raghupathi and V. Raghupathi, *Big Data Analytics in Healthcare*, 1st Edition, Springer, 2014.
 T2. R. C. McLaughlin and C. D. Kaluzny, *Continuous Quality Improvement in Health Care*, 5th Edition, Jones & Bartlett, 2013.

Reference Books:

- R1. W. N. Zelman, M. J. McCue, N. D. Glick, and M. S. Thomas, *Financial Management of Health Care Organizations*, 4th Edition, Jossey-Bass, 2020.
 R2. R. Gensinger, *Analytics in Healthcare: An Introduction*, 1st Edition, HIMSS Publishing, 2014.

Online Resources:

1. <https://hbr.org/1992/01/the-balanced-scorecard-measures-that-drive-performance-2>: by R. S. Kaplan and D. P. Norton
2. <https://www.infosys.com/services/data-analytics/case-studies/healthcare-operational-efficiency.html>
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain performance intelligence concepts and dimensions for data-driven healthcare decisions.
CO2	Analyze strategy alignment using balanced scorecard and cascading KPIs in healthcare.
CO3	Design healthcare KPIs and metrics for clinical, operational, financial and patient outcomes.
CO4	Analyze healthcare performance using analytics, benchmarking and variance analysis.
CO5	Apply command center concepts for real-time KPI monitoring and operational control.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	3	3	1	2	3	2	2
CO2	3	2	2	3	2	3	3	3	2	2	3	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	1	1
CO4	3	1	1	2	2	2		2	1	1	2	1	1
CO5	3	2	2	2	1	3		3	1	2	3	2	1

Category	Code	AI in Healthcare Systems	L-T-P	Credits	Marks
PCR	DH5011		3-0-0	3	100

Objectives	The objective of this course is to provide an understanding of Artificial Intelligence (AI) applications in healthcare systems, focusing on real-world use cases, system integration, and decision support.
Pre-Requisites	Knowledge of healthcare workflows, data concepts, and digital systems is required.
Teaching Scheme	Regular classroom lectures supported by case studies, AI use-case discussions, system demonstrations, and healthcare AI implementation scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	AI in Healthcare: Overview of Artificial Intelligence – Concepts of AI, Machine Learning, Deep Learning (high-level); AI in Healthcare Ecosystem – Role in Clinical, Operational, and Administrative domains; Types of AI Applications – Predictive, Prescriptive, and Cognitive AI; Data Requirements for AI – Structured vs unstructured data in healthcare; Challenges in AI Adoption – Data quality, Integration, Trust, Regulatory issues.	8 Hours
Module-2	AI for Clinical Decision Support: Clinical Decision Support Systems (CDSS) – AI-driven recommendations; AI in Diagnostics – Radiology, Pathology, Imaging analysis; Predictive Models – Risk prediction, Disease progression; Natural Language Processing (NLP) – Clinical documentation analysis; AI in Personalized Medicine – Precision healthcare approaches.	10 Hours
Module-3	AI for Healthcare Operations: AI for Patient Flow Management – Predicting demand and load; Bed Management Optimization – AI-based allocation models; Scheduling Optimization – OPD, OT Scheduling using AI; Resource Allocation – Staff and equipment optimization; Automation – AI-driven workflow automation in hospitals.	8 Hours
Module-4	AI for Healthcare Command Centers: AI-Driven Dashboards – Predictive and prescriptive insights; Real-Time Analytics – AI-based alerts and anomaly detection; Command Center Integration – AI for proactive decision-making; Population Health Analytics – Risk stratification and cohort analysis; Predictive Healthcare Systems – Forecasting demand and outcomes.	8 Hours
Module-5	Responsible AI in Healthcare: Ethical Considerations – Bias, fairness, transparency; Regulatory Frameworks – AI governance in healthcare; Data Privacy – Alignment with DPDP Act and global standards; Explainable AI (XAI) – Trust and interpretability; Future Trends – AI-driven hospitals, digital twins, autonomous systems.	8 Hours
Total		42 Hours

Text Books:

- T1. F. Jiang, et al., *Artificial Intelligence in Healthcare*, 1st Edition, Academic Press, 2020.
- T2. A. Bohr and K. Memarzadeh, *Artificial Intelligence in Healthcare*, 1st Edition, Elsevier, 2020.
- T3. W. Raghupathi and V. Raghupathi, *Big Data Analytics in Healthcare*, 1st Edition, Springer, 2014.

Reference Books:

- R1. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.
- R2. E. Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, 1st Edition, Basic Books, 2019.
- R3. World Health Organization, *Ethics and Governance of Artificial Intelligence for Health: Guidance on Large Multi-modal Models*, 1st Edition, WHO, 2024.

Online Resources:

1. <https://classroom.eneri.eu/sites/default/files/2024-12/Case%20study%20AI%20in%20healthcare%20%281%29.pdf>: AI in healthcare case study, irecs
2. https://wjbphs.com/sites/default/files/fulltext_pdf/WJBPHS-2024-0783.pdf: by G. Chamrathy et. al.

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

CO1	Explain the concepts and applications of AI in healthcare systems.
CO2	Analyze AI applications in clinical decision support and diagnostics.
CO3	Apply AI concepts for healthcare operations and workflow optimization.
CO4	Evaluate AI-driven analytics and command center applications.
CO5	Assess ethical, regulatory, and future implications of AI in healthcare.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	2	3	1	2	2	3	1	2	3	1	1
CO2	3	1	1	2	1	2	2	2	1	2	2	1	1
CO3	3	2	2	2	1	3	2	2	2	2	2	1	1
CO4	2	1	1	1	2	2	2	2	1	1	2	1	1
CO5	3	2	2	2	2	3	3	3	1	2	3	1	1

Category	Code	System Selection & RFP Process	L-T-P	Credits	Marks
PEL	DH5015		3-0-0	3	100

Objectives	This course aims to impart knowledge and useful skills required to evaluate, select, and procure healthcare information systems for digital healthcare transformation.
Pre-Requisites	Understanding of healthcare systems, digital health technologies, and basic IT concepts is required.
Teaching Scheme	Regular classroom lectures supported by case studies, real-world RFP documents, vendor evaluation exercises, and procurement simulations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Healthcare IT Procurement: Need for Structured Procurement – Risks of poor system selection; Procurement Lifecycle in Healthcare IT; Stakeholders in Selection Process – Clinical, IT, management; Challenges in Healthcare IT Procurement.	8 Hours
Module-2	Requirement Gathering & Scope Definition: Functional Requirements – Clinical, operational, administrative; Non-Functional Requirements – Performance, scalability, security; User Requirement Specification (URS), Workflow Mapping for Requirement Identification; Prioritization of Requirements.	10 Hours
Module-3	RFP Preparation & Documentation: Structure of RFP Document – Introduction, Scope, Functional requirements, Technical requirements, Evaluation criteria; Types of Procurement Documents – RFI, RFQ, RFP; Drafting RFP for Healthcare Systems; Defining SLAs and KPIs in RFP.	8 Hours
Module-4	Vendor Evaluation & Selection Process: Vendor Shortlisting Techniques; Technical Evaluation – System capabilities, architecture fit; Functional Evaluation – Clinical and operational fit; Commercial Evaluation – Cost models (CAPEX vs OPEX); Demo and Proof of Concept (POC); Scoring Models and Decision Matrix.	8 Hours
Module-5	Contracting, Negotiation & Risk Management: Contract Types – Fixed, subscription, SaaS; Key Contract Components: SLAs, penalties, support terms; Negotiation Strategies with Vendors, Risk Identification in Vendor Selection Legal and Compliance Considerations.	8 Hours
Total		42 Hours

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. Project Management Institute (PMI), *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 7th Edition, PMI, 2021..

Reference Books:

- R1. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

- R2. HIMSS, *Healthcare IT Procurement Guidelines*, Latest Edition, HIMSS, 2022.
 R3. World Bank, *Procurement Framework Guidelines*, Latest Edition, World Bank, 2020.

Online Resources:

1. <https://journal.ahima.org/Portals/0/archives/AHIMA%20files/RFP%20Process%20for%20EHR%20Systems.pdf>: RFP Process for EHR Systems
2. <https://nabh.co/digital-toolkit-for-hospitals/>: Digital Toolkit for Hospitals

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the healthcare IT procurement lifecycle and challenges.
CO2	Develop functional and non-functional requirements for healthcare systems.
CO3	Prepare structured RFP documents for healthcare IT procurement.
CO4	Evaluate vendors using technical, functional, and commercial criteria.
CO5	Apply contract management and negotiation strategies in healthcare IT procurement.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	1	3		3	3	3	2	2	3	2	2
CO2	3	2	2	3		3	3	3	1	2	3	2	2
CO3	3	2	2	2		3	2	3	1	2	3	2	2
CO4	3	2	2	2		2	3	3	1	1	3	1	1
CO5	2	1	1	1		2	1	2	1	1	2	1	1

Category	Code	Digitally Enabled Hospital Operations	L-T-P	Credits	Marks
PEL	DH5016		3-0-0	3	100

Objectives	This course aims to provide an in-depth understanding of digitally enabled hospital operations focusing on how digital systems optimize workflows, improve efficiency, enhance patient experience, and enable real-time operational control in hospitals.
Pre-Requisites	Knowledge and understanding of healthcare systems, digital healthcare systems, and hospital workflows is required.
Teaching Scheme	Regular classroom lectures supported by operational case studies, hospital process simulations, digital system demonstrations, and real-world scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Concept of Digital Hospital – Integrated and automated operations; Operational Areas in Hospitals – Clinical and non-clinical; Role of Digital Systems in Operations – HIS, EMR, ERP, Support systems; Manual to Digital Operations – Evolution, Benefits, and Challenges.	6 Hours
Module-2	Digitalized Clinical Operations: OPD Operations – Appointment scheduling, Registration, Consultation; IPD Operations – Admission, Care delivery, Discharge processes; Emergency Department Operations – Triage, Rapid response systems; ICU Operations – Monitoring and digital care coordination.	10 Hours
Module-3	Digitalized Support Services Operations: Laboratory Operations – Order entry, Reporting, TAT management; Radiology Operations – Imaging workflows and reporting; Pharmacy Operations – E-prescription, Dispensing, Inventory integration; Billing and Revenue Capture; Supply Chain – Inventory and purchase.	10 Hours
Module-4	Patient-Centric Digital Operations: Digital Patient Journey – End-to-end patient lifecycle; Patient Engagement Tools – Portals, Apps, Communication systems; Queue Management and Waiting Time Optimization; Telemedicine and Remote care; Feedback and Experience Management Systems.	10 Hours
Module-5	Real-Time Operations: Concept of Operational Command Centers; Real-Time Monitoring of Hospital Operations; Operational Alerts and Exception Management.	6 Hours
Total		42 Hours

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. M. Abdelhak and M. A. Hanken, *Health Information: Management of a Strategic Resource*, 5th Edition, Springer, 2014.

Reference Books:

- R1. R. C. McLaughlin and C. D. Kaluzny, *Continuous Quality Improvement in Health Care*, 5th Edition, Jones & Bartlett, 2013.
- R2. HIMSS, *Digital Health Systems and Operations Guidelines*, Latest Edition, HIMSS, 2022.

Online Resources:

1. <https://curogram.com/blog/healthcare-workflow-automation>: 35 Game-Changing Examples of Healthcare Workflow Automation to Revolutionize Patient Care, Alvin Amoroso
2. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8318703/>: Identifying Opportunities for Workflow Automation in Health Care: Lessons Learned from Other Industries
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain digitally enabled hospital operations across clinical and support services.
CO2	Analyze the role of digital systems in optimizing hospital workflows and efficiency.
CO3	Evaluate integrated operations across departments using digital platforms.
CO4	Assess patient-centric digital operations and experience management systems.
CO5	Apply real-time operational management concepts using command center frameworks.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3		3	1	2	3	2	2
CO2	3	2	1	2	2	3		3	1	3	3	2	2
CO3	3	1	1	2	2	2		2	2	3	3	1	1
CO4	3	2	2	2	1	3		3	1	2	3	2	1
CO5	2	2	1	2	1	2		2	1	2	2	1	1

Category	Code	Healthcare Quality Management Systems	L-T-P	Credits	Marks
PEL	DH5017		3-0-0	3	100

Objectives	This course aims to provide a comprehensive understanding of healthcare quality management systems, frameworks, and continuous improvement methodologies by focusing on designing and implementing quality systems to ensure patient safety, clinical effectiveness, and operational excellence.
Pre-Requisites	Understanding of healthcare systems and hospital operations is required.
Teaching Scheme	Regular classroom lectures supported by case studies, quality improvement exercises, framework-based learning, and healthcare scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Quality in Healthcare: Concept of Quality in Healthcare; Dimensions of Quality – Safety, Effectiveness, Patient-centeredness, Timeliness, Efficiency, Equity; Evolution of Healthcare Quality Systems; Quality vs Compliance vs Performance; Challenges in Maintaining Quality in Healthcare.	8 Hours
Module-2	Frameworks and Models: Total Quality Management (TQM); Continuous Quality Improvement (CQI); Lean Healthcare and Six Sigma Concepts; PDCA (Plan-Do-Check-Act) Cycle; Quality Indicators and Metrics.	8 Hours
Module-3	Clinical Quality & Patient Care Standards: Clinical Governance in Healthcare Standard Treatment Protocols; Clinical Pathways and Care Standardization; Evidence-Based Medicine and Quality; Monitoring Clinical Outcomes.	8 Hours
Module-4	Quality Assurance & Improvement: Quality Assurance vs Quality Improvement; Audit Systems in Healthcare; Internal and External Quality Audits; Root Cause Analysis (RCA); Corrective and Preventive Actions (CAPA).	10 Hours
Module-5	Leadership & Digital Enablement: Building a Quality Culture in Hospitals; Role of Leadership in Quality Management; Staff Training and Engagement in Quality Initiatives; Digital Tools for Quality Monitoring; Future of Quality – Data-driven and AI-enabled systems.	8 Hours
Total		42 Hours

Text Books:

- T1. G. J. Gyani and A. Thomas, *Handbook Of Healthcare Quality & Patient Safety*, 3rd Edition, Jaypee Brothers Medical Publishers, 2021.
- T2. A. Sharma, V. Gamta, and G. Luthra, *Risk-Based Quality Management in Healthcare Organization : A Guide based on ISO 13485 and EU MDR*, 1st Edition, Notion Press, 2023.

Reference Books:

- R1. P. L. Spath and D. L. Kelly, *Applying Quality Management in Healthcare: A Systems Approach*, 4th Edition, Aupha/Hap Book, 2017.
- R2. World Health Organization, *Quality of Care Framework and Patient Safety Guidelines*, Latest Edition, WHO, 2023.
- R3. Institute for Healthcare Improvement, *Quality Improvement Essentials Toolkit*, Latest Resources, IHI, 2024.

Online Resources:

1. <https://www.jointcommissioninternational.org/resources>: JCI Quality and Patient Safety Resources
2. <https://www.ahrq.gov>: AHRQ Patient Safety and Quality Improvement Case Studies
3. <https://www.who.int/publications/i/item/9789241511216>: WHO Quality of Care Framework
4. <https://www.ihl.org/resources>: IHI Quality Improvement Case Studies and Tools

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the concept, dimensions, and evolution of quality in healthcare systems.
CO2	Apply key quality management frameworks and methodologies in healthcare.
CO3	Analyze clinical governance and standards for ensuring quality patient care.
CO4	Implement quality assurance and improvement systems used in healthcare.
CO5	Explore quality culture, leadership, and digital enablement in healthcare organizations.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	3		3	1	2	3	2	2
CO2	3	2	1	2	2	3		3	1	3	3	2	2
CO3	3	2	2	2	2	3		3	2	3	3	1	2
CO4	2	2	2	1	1	2		2	1	2	3	1	1
CO5	2	2	2	2	1	2		2	1	2	3	1	1

Category	Code	Systems Integration in Healthcare	L-T-P	Credits	Marks
PEL	DH5018		3-0-0	3	100

Objectives	This course aims to provide practical knowledge of integrating healthcare information systems in real-world environments by focusing on integration approaches, interface implementation, data exchange workflows, and operational challenges in connecting multiple healthcare systems.
Pre-Requisites	Understanding of healthcare systems, HIS/EMR implementation lifecycle, and basic interoperability concepts is required.
Teaching Scheme	Regular classroom lectures supported by real-world integration scenarios, interface mapping exercises, case studies, and practical workflow simulations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Healthcare Systems Integration, Need for Integration in Healthcare – Fragmented systems and data silos; Integration Scenarios – Clinical, Operational, Financial data exchange; Challenges in Integration – Legacy systems, Vendor diversity.	8 Hours
Module-2	Integration Approaches & Methods: Point-to-Point Integration – Advantages and limitations; Middleware-Based Integration – Interface engines and hubs; API-Based Integration – REST APIs and web services; Batch vs Real-Time Integration; Choosing the Right Integration Approach.	10 Hours
Module-3	Interface Development & Data Exchange Workflows: Interface Design – Mapping data between systems; HL7 Message Flow; FHIR-Based Integration; DICOM Workflow Integration; Data Mapping and Transformation Techniques.	8 Hours
Module-4	Integration Testing, Deployment & Monitoring: Integration Testing Types – Unit, System, End-to-end testing; Error Handling and Debugging Integration Issues; Deployment Strategies for Interfaces; Monitoring Integration Performance; Managing Downtime and Failures.	8 Hours
Module-5	Integration Governance, Security & Scalability: Integration Governance Models – Ownership, Control, Policies; Security in Integration – Authentication, Authorization, Encryption; Data Privacy Considerations; Scalability of Integration Systems; Integration in Large Hospital Networks and Digital Ecosystem.	8 Hours
Total		42 Hours

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.

Reference Books:

- R1. HL7 International, *FHIR Release 4 (R4) Specification*, Latest Release, 2019.
- R2. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.

R3. HIMSS, *Interoperability and Integration Guidelines*, Latest Edition, HIMSS, 2022.

Online Resources:

1. <https://www.sciencedirect.com/science/article/pii/S1532046411001262>: The Need for Systems Integration in Health Care, S. C. Mathews and P. J. Pronovost
2. <https://www.healthdesign.org/knowledge-repository/technology-integration-complex-healthcare-environments-systematic-literature> : Technology integration in complex healthcare environments: A systematic literature review
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain integration requirements and challenges in healthcare systems.
CO2	Evaluate different integration approaches and select appropriate methods.
CO3	Apply interface design and data exchange techniques in healthcare integration.
CO4	Manage integration testing, deployment, and monitoring processes.
CO5	Assess governance, security, and scalability aspects of integrated healthcare systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	3		3	2	2	3	2	2
CO2	3	2	3	3	1	3		3	1	1	3	2	2
CO3	2	2	2	2	1	2		2	1	2	2	1	1
CO4	2	1	1	2	2	3		2	1	1	2	1	1
CO5	2	2	2	2	1	2		2	1	1	2	1	1

Category	Code	Digital Health Product Management	L-T-P	Credits	Marks
PEL	DH5019		3-0-0	3	100

Objectives	This course aims to develop capabilities in designing, managing, and scaling digital health products by focusing on product lifecycle management, user-centric design, digital platforms, and go-to-market strategies.
Pre-Requisites	Knowledge and understanding of healthcare systems, digital health technologies, and basic innovation concepts is required.
Teaching Scheme	Regular classroom lectures supported by product case studies, design exercises, product simulations, and startup ecosystem discussions.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Digital Health Products, Product Management Concepts; Types of Products – HIS, EMR, Mobile apps, Telemedicine platforms; Product vs Project Thinking; Key Challenges in Health-tech Product Development.	8 Hours
Module-2	Product Lifecycle & Development Process: Product Lifecycle Stages – Ideation, Development, Launch, Growth; Product Requirement Documents (PRD), Agile Product Development in Healthcare; Stakeholder Management (Clinicians, Patients, IT teams); Prioritization Techniques (MVP, backlog management).	10 Hours
Module-3	User-Centric Design & Experience (UI/UX): Design Thinking in Healthcare; Understanding User Personas – Patients, Doctors, Admin; User Journey Mapping; UI/UX Principles in Healthcare Applications; Accessibility and Usability Considerations.	8 Hours
Module-4	Digital Health Platforms & Product Strategy: Platform-Based Healthcare Models; API Economy and Ecosystem Integration; Product Strategy and Roadmapping; Monetization Models in Digital Health; Go-to-Market Strategies.	8 Hours
Module-5	Product Analytics, Compliance & Scaling: Product Performance Metrics (engagement, retention); Feedback Loops and Continuous Improvement; Regulatory and Compliance Considerations (DPDP, ABDM); Scaling Digital Health Products.	8 Hours
Total		42 Hours

Text Books:

- T1. M. Cagan, *Inspired: How to Create Tech Products Customers Love*, 2nd Edition, John Wiley & Sons, 2018.
- T2. .B. Yoskovitz and A. Croll, *Lean Product and Lean Analytics*, 1st Edition, O'Reilly Media, 2013.

Reference Books:

- R1. E. Ries, *The Lean Startup*, 1st Edition, Crown Business, 2011.
- R2. HIMSS, *Digital Health Product and Platform Reports*, Latest Edition, HIMSS, 2022–2024.
- R3. Selected research articles from various scientific journals.

Online Resources:

1. <https://productschool.com/blog/digital-transformation/healthcare-product-management>: The Long-awaited Cure?, by C. G. Villaumbrosia, 2024
2. <https://www.s3connectedhealth.com/resources/white-papers/from-medical-devices-to-digital-health-ecosystems>: From Medical Devices to Digital Health Ecosystems: Navigating the Complexities of Product Development, S3 Connected Health.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain digital health product concepts and lifecycle stages.
CO2	Develop product requirements and apply agile product development approaches.
CO3	Design user-centric healthcare solutions using UX principles.
CO4	Evaluate product strategies, platforms, and go-to-market approaches.
CO5	Assess product performance, compliance, and scaling strategies.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3		2	2	2	3	2	2
CO2	3	2	2	2	1	3		3	1	2	3	2	2
CO3	3	2	2	3	2	3		3	2	2	3	2	2
CO4	2	1	1	2	1	2		1	1	1	2	1	1
CO5	2	2	1	2	1	1		1	1	1	2	1	1

Category	Code	Patient Safety & Risk Management	L-T-P	Credits	Marks
PEL	DH5020		3-0-0	3	100

Objectives	This course aims to provide a comprehensive understanding of patient safety principles and risk management practices in healthcare, focusing on identifying, analyzing, and mitigating risks to improve patient outcomes and ensure safe healthcare delivery.
Pre-Requisites	Knowledge and understanding of healthcare systems and quality management concepts is required.
Teaching Scheme	Regular classroom lectures supported by real-world incident case studies, safety analysis exercises, and risk management simulations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Fundamentals of Patient Safety: Concept of Patient Safety in Healthcare; Types of Medical Errors – Diagnostic, Medication, Procedural; Adverse Events and Near Misses, Burden of Unsafe Care (Global and India context), Culture of Safety in Healthcare Organizations.	8 Hours
Module-2	Risk Management in Healthcare: Concept of Risk in Healthcare Systems; Types of Risks – Clinical, operational, technological; Risk Identification Techniques; Risk Assessment Models (Severity vs Probability); Risk Register and Documentation.	8 Hours
Module-3	Incident Reporting & Analysis: Incident Reporting Systems (IRS); Root Cause Analysis (RCA); Failure Mode & Effects Analysis (FMEA); Sentinel Events & Serious Reportable Events; Learning from Errors & Incident Trends.	10 Hours
Module-4	Patient Safety Practices: Medication Safety Systems; Infection Prevention and Control (IPC); Surgical Safety (WHO Surgical Safety Checklist); Clinical Handover and Communication Safety; Use of Technology in Patient Safety (alerts, EMR safety features).	8 Hours
Module-5	Risk Mitigation & Future Trends: Risk Mitigation Strategies and Controls; Patient Safety Governance Structures; Legal and Ethical Aspects of Patient Safety; Digital Risk Management (AI, IoT risks); Future Trends in Patient Safety and Risk Management.	8 Hours
Total		42 Hours

Text Books:

- T1. A. Sharma, V. Gamta, and G. Luthra, *Risk-Based Quality Management in Healthcare Organization : A Guide based on ISO 13485 and EU MDR*, 1st Edition, Notion Press, 2023.
- T2. G. J. Gyani and A. Thomas, *Handbook Of Healthcare Quality & Patient Safety*, 3rd Edition, Jaypee Brothers Medical Publishers, 2021.

Reference Books:

- R1. World Health Organization, *Patient Safety Curriculum Guide and Global Patient Safety Action Plan*, Latest Edition, WHO, 2021–2023.

- R2. Agency for Healthcare Research and Quality, *Patient Safety Network (PSNet) Resources*, Latest Edition, 2022–2024.
- R3. Institute for Healthcare Improvement, *Patient Safety Tools and Frameworks*, Latest Resources, 2022–2024.

Online Resources:

1. <https://gciamt.org/wp-content/uploads/2021/09/Patient-safety-challenges-in-a-case-study-hospital--Of.pdf>: Patient safety challenges in a case study hospital – Of relevance for transfusion processes, Karina Aase et al.
2. <https://www.who.int/news-room/fact-sheets/detail/patient-safety:Patientsafety,2023>
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain patient safety concepts and types of medical errors.
CO2	Apply risk identification and assessment techniques in healthcare.
CO3	Analyze incidents using RCA, FMEA, and reporting systems.
CO4	Implement patient safety practices and risk mitigation strategies.
CO5	Evaluate governance, legal, and future aspects of patient safety.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	3		3	1	2	3	2	2
CO2	3	2	1	2	1	3		3	1	2	3	2	2
CO3	3	3	2	3	2	3		3	2	2	3	3	2
CO4	3	2	2	2	1	2		2	1	1	3	1	1
CO5	2	2	1	2	1	2		2	1	1	2	1	1

Category	Code	Healthcare Performance Intelligence Lab	L-T-P	Credits	Marks
PCR	DH5012		0-0-4	2	100

Objectives	This laboratory course is to develop practical skills in interpreting healthcare performance data, designing strategy-aligned dashboards, and supporting decision-making using performance intelligence frameworks.
Pre-Requisites	Knowledge of healthcare KPIs, analytics concepts, and performance frameworks.
Teaching Scheme	Regular laboratory sessions involving dashboard interpretation, scenario-based analysis, benchmarking exercises, and decision-making simulations.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Understanding healthcare dashboards: operational, clinical, financial views.
3-4	Interpreting performance dashboards (OPD, IPD, diagnostics).
5-6	Identifying performance gaps using KPI trends.
7-8	Benchmarking hospital performance (internal vs external).
9-10	Variance analysis and deviation identification.
11-12	Root cause analysis using case scenarios.
13-14	Balanced Scorecard interpretation in healthcare.
15-16	Strategy-to-KPI mapping exercise.
17-18	Command center dashboards: structure and components.
19-20	Real-time monitoring scenarios and alert interpretation.
21-22	Decision-making simulation: resource allocation based on KPIs.
23-24	Scenario-based performance improvement planning.
25-26	Mini project: Design and interpret a performance intelligence dashboard.
27-28	Project presentation and evaluation.

Text Books:

- T1. W. Raghupathi and V. Raghupathi, *Big Data Analytics in Healthcare*, 1st Edition, Springer, 2014.
- T2. R. C. McLaughlin and C. D. Kaluzny, *Continuous Quality Improvement in Health Care*, 5th Edition, Jones & Bartlett, 2013.

Reference Books:

- R1. W. N. Zelman, M. J. McCue, N. D. Glick, and M. S. Thomas, *Financial Management of Health Care Organizations*, 4th Edition, Jossey-Bass, 2020.
- R2. R. Gensinger, *Analytics in Healthcare: An Introduction*, 1st Edition, HIMSS Publishing, 2014.

Online Resources:

1. <https://hbr.org/1992/01/the-balanced-scorecard-measures-that-drive-performance-2>: by R. S. Kaplan and D. P. Norton
2. <https://www.infosys.com/services/data-analytics/case-studies/healthcare-operational-efficiency.html>

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Interpret healthcare performance dashboards and KPIs.
CO2	Analyze performance trends and identify improvement areas.
CO3	Apply benchmarking and variance analysis techniques.
CO4	Support decision-making using performance intelligence frameworks.
CO5	Evaluate real-time performance scenarios using command center concepts.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2		2		3	1	2	3	2	1
CO2	3	2	2	2		1		2	2	2	2	1	1
CO3	3	2	1	2		2		2	2	2	2	1	1
CO4	3	3	2	2		2		3	2	1	3	1	1
CO5	3	1	1	2		2		3	2	2	3	2	2

Category	Code	AI in Healthcare Systems Lab	L-T-P	Credits	Marks
PCR	DH5013		0-0-2	1	100

Objectives	The objective of this laboratory course is to provide hands-on exposure to AI applications in healthcare, focusing on use-case understanding, model interpretation, and decision-support integration.
Pre-Requisites	Understanding of AI in healthcare systems taught in theory class is required.
Teaching Scheme	Regular laboratory sessions involving AI use-case demonstrations, simulations, case studies, and interpretation of AI outputs in healthcare scenarios.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Introduction to AI tools and platforms used in healthcare.
3-4	AI-based clinical decision support system demonstration.
5-6	Interpreting AI outputs in diagnostic scenarios.
7-8	Predictive analytics: patient risk prediction use case.
9-10	AI in operations: demand forecasting and scheduling.
11	NLP use case: extracting insights from clinical notes.
12	AI-enabled command center: alert and anomaly detection interpretation.
13-14	Mini project: Evaluate an AI use-case and recommend implementation strategy.

Text Books:

- T1. F. Jiang, et al., *Artificial Intelligence in Healthcare*, 1st Edition, Academic Press, 2020.
- T2. A. Bohr and K. Memarzadeh, *Artificial Intelligence in Healthcare*, 1st Edition, Elsevier, 2020.
- T3. W. Raghupathi and V. Raghupathi, *Big Data Analytics in Healthcare*, 1st Edition, Springer, 2014.

Reference Books:

- R1. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.
- R2. E. Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, 1st Edition, Basic Books, 2019.
- R3. World Health Organization, *Ethics and Governance of Artificial Intelligence for Health: Guidance on Large Multi-modal Models*, 1st Edition, WHO, 2024.

Online Resources:

1. <https://classroom.eneri.eu/sites/default/files/2024-12/Case%20study%20AI%20in%20healthcare%20%281%29.pdf>: AI in healthcare case study, irecs
2. <https://wjbphs.com/sites/default/files/fulltext.pdf/WJBPHS-2024-0783.pdf>: by G. Chamrathy et. al.
3. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8285156/>
4. <https://www.sciencedirect.com/science/article/pii/S2949916X24000616>
5. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Demonstrate understanding of AI applications in healthcare.
CO2	Interpret AI outputs in clinical and operational scenarios.
CO3	Analyze effectiveness of AI-driven insights for decision-making.
CO4	Evaluate AI-based applications & use-cases in healthcare systems.
CO5	Recommend AI-enabled solutions for addressing healthcare challenges.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2		2	1	2	2	2	1
CO2	3	2	2	2	1	2		2	2	2	2	2	1
CO3	2	2	1	2	1	2		2	2	2	2	1	1
CO4	2	2	2	2	1	2		2	2	3	2	2	2
CO5	3	3	3	3	1	2		2	2	2	2	2	2

Category	Code	Health Systems Integration Lab	L-T-P	Credits	Marks
PCR	DH5014		0-0-4	2	100

Objectives	This laboratory course aims to provide hands-on experience in practicing healthcare system integrations by applying interoperability, data exchange, API-based integration, and real-world system connectivity scenarios.
Pre-Requisites	Knowledge of digital healthcare systems and healthcare data standards is required.
Teaching Scheme	Regular laboratory sessions involving integration simulations, API exercises, data exchange modeling, and case-based system connectivity scenarios.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Introduction to healthcare system architecture and integration scenarios.
3-4	Mapping system architecture: HIS, LIS, RIS, PACS integration design.
5-6	Designing point-to-point vs middleware-based integration models.
7-8	API fundamentals: REST APIs and data exchange concepts.
9-10	Creating basic API requests (GET/POST) using sample healthcare data.
11-12	FHIR resources: creating patient and observation data structures.
13-14	HL7 message structure: parsing and interpreting sample messages.
15-16	Designing data flow between systems (case-based).
17-18	Health Information Exchange (HIE) architecture modeling.
19-20	ABDM integration workflow simulation (ABHA-based data exchange).
21-22	Security in integration: authentication and access control concepts.
23-24	Interoperability challenges and error handling scenarios.
25-26	Mini project: Design integration architecture for a hospital.
27-28	Project presentation and evaluation.

Text Books:

- T1. K. A. Kuhn, *Medical Informatics: Practical Guide for Healthcare and IT Professionals*, Springer, 2018.
- T2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

Reference Books:

- R1. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.
- R2. HL7.org, *FHIR Specification (Release 4)*, 2019.

Online Resources:

1. https://www.linuxfoundation.org/hubfs/LF%20Research/lfr_healthdata2024.102824a.pdf: Open Architecture for Health Data Interoperability, Anna Hermansen, The Linux Foundation, 2024
2. https://www.medtecheurope.org/wp-content/uploads/2021/10/mte_interoperability_digital_health_white-paper_06oct21.pdf: Interoperability standards in digital health, Medtech Europe, 2021

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain integration of healthcare systems and their architectures.
CO2	Apply interoperability frameworks such as HL7 and FHIR for system integration.
CO3	Develop API-based data exchange models in multi-vendor scenarios.
CO4	Analyze healthcare data flow and system integration challenges.
CO5	Evaluate interoperability solutions in real-world healthcare systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	2		2	1	2	2	1	1
CO2	2	1	1	2	3	3		2	2	2	2	1	2
CO3	2	1	1	1	1	2		3	1	1	2	1	2
CO4	2	2	2	2	2	2		2	2	1	2	2	2
CO5	3	2	2	2	2	2		2	2	2	3	2	2

Category	Code	Communication & Soft Skills	L-T-P	Credits	Marks
SEC	HS5003		0-0-2	1	100

Objectives	The objectives of this laboratory course are to develop effective communication and soft skills, such as negotiation, assertiveness, teamwork, leadership, presentation, writing e-mails, business letters, and reports, etc.
Pre-Requisites	Knowledge of English and basic communication skills is required.
Teaching Scheme	Regular laboratory classes pair through and/or team activities with regular assessments, presentations, discussions, role-playing, audio-visual supplements, writing activities, business writing practices and vocabulary enhancement.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Introduction to the course and diagnostic test
2	Personality development and soft skills for professionals
3	Group Discussion (GD): Mock GD 1
4	Group Discussion (GD): Mock GD 2
5	Verbal Ability
6	Writing a compelling resume and cover letter
7	Personal Interview FAQs
8	Mock Personal Interview (PI)
9	Assertive communication and negotiation skills
10	Teamwork and leadership skills
11	Powerpoint Presentation 1
12	Powerpoint Presentation 2
13	Writing business letters, email etiquette
14	Preparing Analytical Reports

Text Books:

- T1. M. A. Rizvi, *Effective Technical Communication*, 2nd Edition, Tata McGraw-Hill, 2017.
- T2. M. Raman and S. Sharma, *Technical Communication: Principles and Practice*, 3rd Edition, Oxford University Press, 2015.

Reference Books:

- R1. S. John, *The Oxford Guide to Writing and Speaking*, 3rd Edition, Oxford University Press, 2013.
- R2. S. Kumar and P. Lata, *Communication Skills*, 2nd Edition, Oxford University Press, 2015.
- R3. B. K. Das, K. Samantray, R. Nayak, S. Pani, and S. Mohanty, *An Introduction to Professional English and Soft Skills*, 2nd Edition, Cambridge University Press, 2012.

Online Resources:

1. <https://nptel.ac.in/courses/109/106/109106094/>: By Prof. A. Iqbal, IIT Madras
2. <https://nptel.ac.in/courses/109/104/109104031/>: By Dr. T. Ravichandran, IIT Kanpur

3. <https://www.coursera.org/specializations/business-english>
4. <https://ocw.mit.edu/courses/comparative-media-studies-writing/21w-732-5-introduction-to-technical-communication-explorations-in-scientific-and-technical-writing-fall-2006/download-course-materials/>

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Communicate assertively and make successful negotiations in business situations.
CO2	Improve skills like verbal ability, GD, PI & writing resumes for career success.
CO3	Develop effective team work abilities and take leadership in real-life situations.
CO4	Demonstrate & apply various techniques of effective oral presentation.
CO5	Compose effective business correspondences such as e-mail, business letters, and reports.

Program Outcomes Relevant to the Course:

PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1						2	1	1		1			1
CO2						1	1	1			1		1
CO3						3	1	1		1	1		1
CO4						3	1	3		1	1		1
CO5						1	2	1		1	1	1	1

Category	Code	Digital Transformation in Healthcare	L-T-P	Credits	Marks
PCR	DH6001		3-0-0	3	100

Objectives	The objective of this course is to provide a comprehensive understanding of digital transformation in healthcare, focusing on strategy, implementation frameworks, change management, and value realization.
Pre-Requisites	Knowledge of digital healthcare systems and solution architecture is required.
Teaching Scheme	Regular classroom lectures supported by case studies, transformation frameworks, real-world implementation scenarios, and strategic discussions.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Foundations of Digital Transformation: Digitization vs digitalization vs transformation; Drivers of Transformation – Patient expectations, Cost pressures, Policy push; PPTI Framework in Healthcare Transformation -- People, Process, Technology, Infrastructure; Digital Maturity Models.	8 Hours
Module-2	Digital Transformation Strategy & Roadmap: Aligning digital initiatives with organizational goals; Transformation Roadmap – Phased implementation planning; PPTI-Based Strategy Design – People, Process, Technology, Infrastructure, Gap analysis and prioritization, Stakeholder alignment; Governance Models – Steering committees, Transformation leadership.	10 Hours
Module-3	Implementation Frameworks & Execution Models: Program Management – Managing large-scale digital initiatives, People and change Management, Training and capacity building, Clinical adoption strategies, Process Transformation – SOP redesign, Workflow standardization and optimization; Implementation Challenges – Adoption barriers, Operational disruption.	10 Hours
Module-4	Digitalized Healthcare Operations: End-to-End Digital Operations – OPD, IPD, Diagnostics, Pharmacy digitization; Integrated Digital Systems – HIS, EMR, AI, Analytics platforms; Scalability and system performance; Patient-Centric Digital Experience – Apps, Portals, Engagement platforms.	8 Hours
Module-5	Value Realization & Risks: Measuring Transformation Success – KPIs and value realization; PPTI-based Performance Measurement – People adoption metrics, Process efficiency metrics, Technology utilization, Infrastructure performance, Risk management, Regulatory considerations.	6 Hours
Total		42 Hours

Text Books:

- T1. D. L. Rogers, *The Digital Transformation Playbook: Rethink Your Business for the Digital Age*, 1st Edition, Columbia Business School Publishing, 2016.
- T2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

Reference Books:

- R1. G. C. Kane, et. al., *The Technology Fallacy: How People Are the Real Key to Digital Transformation*, 1st Edition, MIT Press, 2019.

- R2. E. Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*, 1st Edition, Basic Books, 2019.

Online Resources:

1. <https://www.himss.org/resources/digital-health-framework-healthcare-transformation-white-paper/>: Digital health: A framework for Healthcare Transformation
2. <https://www.who.int/publications/i/item/9789240116870>: Global strategy on digital health 2020-2027, WHO, 2025
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain digital transformation concepts and PPTI framework in healthcare.
CO2	Develop PPTI-aligned digital transformation strategies and roadmaps.
CO3	Apply implementation frameworks with focus on people and process transformation.
CO4	Analyze technology and infrastructure requirements for digital healthcare operations.
CO5	Evaluate transformation outcomes, risks, and future trends using PPTI-based metrics.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	3		3	2	2	3	2	2
CO2	3	2	2	3	2	3		3	1	2	3	2	1
CO3	3	1	1	2	1	2		2	1	1	2	1	1
CO4	2	2	2	2	1	3		3	1	1	2	2	2
CO5	2	2	1	2	1	2		2	2	2	3	2	1

Category	Code	Healthcare Data Privacy & Cybersecurity	L-T-P	Credits	Marks
PCR	DH6009		3-0-0	3	100

Objectives	This course introduces data privacy, cybersecurity, and risk management in healthcare, with emphasis on protecting sensitive health data, applying security frameworks, and ensuring regulatory compliance in digital health systems.
Pre-Requisites	Understanding of healthcare systems, digital health technologies, and basic IT infrastructure is required.
Teaching Scheme	Regular classroom lectures supported by real-world cyber incident case studies, risk assessment exercises, compliance frameworks, and security scenario simulations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Healthcare Data Privacy: Nature of Healthcare Data - Clinical, administrative, financial; Importance of Data Privacy; Types of Sensitive Health Information (PHI, PII); Data Lifecycle in Healthcare Systems; Privacy Risks in Digital Healthcare Ecosystems.	8 Hours
Module-2	Regulatory Frameworks & Compliance: Indian Regulations – DPDP Act, ABDM Data Sharing Framework; Global Regulations – HIPAA (USA), GDPR (EU); Consent Management and Data Ownership; Audit and Compliance Requirements.	8 Hours
Module-3	Cybersecurity in Healthcare: Cyber Threat Landscape in Healthcare; Types of Attacks – Ransomware, Phishing, Data breaches; Security Principles – Confidentiality, Integrity, Availability (CIA triad); Access Control Mechanisms – Role-based Access Control (RBAC); Encryption and Data Protection Techniques.	10 Hours
Module-4	Security Architecture & Risk Management: Healthcare IT Security Architecture Overview; Network Security and Endpoint Protection; Cloud Security in Healthcare Systems; Risk Assessment and Vulnerability Management; Incident Response and Disaster Recovery Planning.	8 Hours
Module-5	Privacy by Design & Future Trends: Privacy by Design Principles; Secure System Implementation Practices; Security in Interoperable Systems (APIs and integrations); Emerging Trends: AI Security, IoT Security, Zero-trust Architecture; Case Studies – Healthcare cyber attacks and lessons learned.	8 Hours
Total		42 Hours

Text Books:

- T1. S. P. Murphy, *Healthcare Information Security and Privacy (All-In-One)*, 1st Edition, McGraw-Hill Education, 2014.
- T2. D. J. Solove and P. M. Schwartz, *Information Privacy Law*, 6th Edition, Wolters Kluwer Law & Business, 2020.
- T3. M. E. Whitman and H. J. Mattord, *Principles of Information Security*, 6th Edition, Cengage Learning, 2021.

P.T.O

Reference Books:

- R1. C. S. Kruse, B. Frederick, T. Jacobson, and D. K. Monticone, *Cybersecurity in Healthcare: A Systematic Review of Modern Threats and Trends*, 1st Edition, Springer, 2017.
- R2. HIMSS, *Healthcare Cybersecurity Toolkit*, Latest Edition, HIMSS, 2022.
- R3. NIST, *Cyber Security Framework*, Version 1.1, NIST, 2018.

Online Resources:

1. <https://www.sciencedirect.com/science/article/pii/S2950386825000103>: Cyber-Attacks on Hospital Systems: A Narrative Review, by S. Li, K. Surineni, N. Prabhakaran, 2025
2. <https://medium.com/@rragesh007/few-case-studies-and-examples-of-data-privacy-incidents-in-healthcare-57fc55c301de>: by R. Ragesh, 2024
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe healthcare data types, privacy risks, and data lifecycle in digital healthcare systems.
CO2	Explain healthcare data privacy regulations and compliance frameworks in India and globally.
CO3	Analyze cybersecurity threats and protection mechanisms in healthcare information systems.
CO4	Assess security architecture and risk management strategies in healthcare IT systems.
CO5	Evaluate privacy-by-design principles and emerging security trends in healthcare systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2		2	2	2	2	2	2
CO2	3	2	3	2	1	2		2	1	1	2	1	1
CO3	2	2	2	2	1	2		2	1	2	2	1	1
CO4	2	1	1	2	2	3		2	1	1	2	1	1
CO5	2	2	2	2	1	2		2	1	1	2	1	1

Category	Code	HIS/EMR Implementation Lifecycle	L-T-P	Credits	Marks
PEL	DH6006		3-0-0	3	100

Objectives	The objective of this course is to provide a comprehensive understanding of the end-to-end implementation lifecycle of Hospital Information Systems (HIS) and Electronic Medical Records (EMR).
Pre-Requisites	Understanding of healthcare systems, digital healthcare workflows, and basic IT concepts is required.
Teaching Scheme	Regular classroom lectures supported by implementation case studies, real-world deployment scenarios, configuration exercises, and hospital rollout simulations.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to HIS/EMR Implementation: Overview of HIS and EMR Systems, Implementation Lifecycle Overview – Initiation, Planning, Execution, Go-live, Support; Types of Implementation – Greenfield vs Brownfield; Stakeholders in Implementation – Clinicians, IT, Management, Vendors; Implementation Challenges in Healthcare.	8 Hours
Module-2	Planning & Project Initiation: Project Planning – Scope, Timelines, Milestones; Resource Planning – Team structure and roles; Requirement Validation – Finalizing scope from RFP stage; Risk Planning and Mitigation Strategies; Project Governance and Communication Plans.	9 Hours
Module-3	System Configuration & Customization: System Setup – Modules configuration (OPD, IPD, billing, etc.); Master Data Configuration – Departments, services, users; Workflow Configuration – Customizing processes; Localization Requirements – Regulatory and hospital-specific needs; Data Migration Planning – Legacy to new system.	9 Hours
Module-4	Testing, Training & Go-Live: Types of Testing – Unit, integration, user acceptance testing (UAT); Training Strategies – End-user training, Super-users; Go-Live Planning – Phased vs big-bang approach; Go-Live Support – War room, Issue tracking; Change Management During Go-Live.	8 Hours
Module-5	Post-Implementation Support & Optimization: Stabilization Phase – Issue resolution and system tuning; Performance Monitoring – System usage and efficiency; User Feedback and Continuous Improvement; Enhancements and Version Upgrades; Long-Term System Governance.	8 Hours
Total		42 Hours

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. Project Management Institute (PMI), *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 7th Edition, PMI, 2021..

P.T.O

Reference Books:

- R1. R. E. Hoyt and A. K Yoshihashi, *Health Informatics: Practical Guide for Healthcare and Information Technology Professionals*, 6th Edition, Lulu Press, 2014.
- R2. HIMSS, *Healthcare IT Procurement Guidelines*, Latest Edition, HIMSS, 2022.
- R3. World Health Organization, *Digital Health Implementation Guidelines*, Latest Edition, WHO, 2020.

Online Resources:

1. <https://www.sciencedirect.com/science/article/pii/S1532046411001262>: A case study of an EMR system at a large hospital in India: Challenges and strategies for successful adoption, by J. Scholl, S. Syed-Abdul, L. A. Ahmed.
2. https://www.hispindia.org/docs/hisp_case_study.pdf: Case Studies
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the lifecycle, types, and stakeholders involved in HIS/EMR implementation.
CO2	Explain implementation planning, resource allocation, and governance in HIS/EMR projects.
CO3	Apply system configuration and data migration concepts in healthcare information systems.
CO4	Perform testing, training, and go-live management in HIS/EMR implementation projects.
CO5	Evaluate post-implementation performance and optimization strategies in HIS/EMR systems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	3		3	2	2	3	2	2
CO2	3	2	3	3	1	3		3	1	1	3	2	2
CO3	2	2	2	2	1	2		2	1	2	2	1	1
CO4	2	1	1	2	2	3		2	1	1	2	1	1
CO5	2	2	2	2	1	2		2	1	1	2	1	1

Category	Code	Revenue Cycle Management	L-T-P	Credits	Marks
PEL	DH6007		3-0-0	3	100

Objectives	This course aims provide a comprehensive understanding of revenue cycle management (RCM) in healthcare, focusing on digital systems, financial workflows, and optimization strategies.
Pre-Requisites	Knowledge and understanding of healthcare operations with respect to insurance and billing is required.
Teaching Scheme	Regular classroom lectures supported by billing workflows, case studies, real-world scenarios, and revenue optimization exercises.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Concept of RCM in Healthcare, Revenue Lifecycle -- Registration, Billing, Claims, Payment, Collections; Types of Healthcare Payments – Insurance, Self-pay, Government schemes; Challenges in Revenue Cycle Management; Role of Digital Systems in RCM.	10 Hours
Module-2	Patient Billing Processes: Patient Registration and Insurance Verification; Pre-authorization and Eligibility Checks; Charge Capture Processes – Services, Procedures, Consumables; Billing Systems in HIS/EMR; Common Billing Errors and Leakages.	10 Hours
Module-3	Claims & Insurance Processes: Claims Lifecycle -- Submission, Adjudication, Settlement; Types of Claims – Cashless vs Reimbursement; Coding Systems in Billing; Denial Management – Causes and resolution strategies; Government Schemes (India) – Ayushman Bharat and TPA workflows.	10 Hours
Module-4	Revenue Collection & Optimization: Payment Collection Processes; Accounts Receivable (AR) Management; Revenue Leakage Identification and Prevention; Digital Payment Systems in Healthcare.	6 Hours
Module-5	Advanced RCM & Future Trends: Automation in RCM: AI, Bots, Workflow automation; Revenue Cycle Integration with Hospital Systems; Compliance and Audit in Billing Systems; Value-Based Care and Revenue Models; Future of RCM – Digital-first healthcare finance.	6 Hours
Total		42 Hours

Text Books:

- T1. S. Moheiser and K. Tolliver, *Revenue Cycle Management: Don't Get Lost In The Financial Maze*, 1st Edition, MGMA, 2020.
- T2. J. Mantas et al., *Health Informatics: An Interdisciplinary Approach*, IOS Press, 2020.

Reference Books:

- R1. Healthcare Financial Management Association, *R1. RCM Best Practices and Industry Reports*, Latest Edition, 2022-2024.
- R2. National Health Authority, *PMJAY Operational Guidelines and Claims Processing Documents*, Latest Version, NHA, 2023.

Online Resources:

1. <https://corporatefinance.kpmg.com/kpmg-us/content/dam/kpmg/corporatefinance/pdfs/2025/revenue-cycle-management-ma.pdf>: Revenue Cycle Management M & A Update, KPMG, 2025
2. <https://www.mckinsey.com/~media/McKinsey/Industries/Healthcare%20Systems%20and%20Services/Our%20Insights/From%20revenue%20cycle%20management%20to%20revenue%20excellence/From-revenue-cycle-management-to-revenue-excellence.pdf>: From revenue cycle management to revenue excellence, McKinsey & Company, 2018
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the end-to-end revenue cycle management process in healthcare.
CO2	Analyze patient registration, billing, and charge capture workflows.
CO3	Evaluate claims management and insurance claim processes & settlement.
CO4	Apply revenue optimization and payment collection strategies.
CO5	Assess advanced RCM models and explore future digital transformation trends.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	3		3	2	2	3	2	1
CO2	3	2	2	2	2	3		3	1	3	3	1	1
CO3	3	3	2	2	2	3		3	2	2	3	1	1
CO4	2	2	1	2	2	2		2	2	2	2	2	2
CO5	2	2	2	2	1	2		2	1	2	2	1	1

Category	Code	Quality Accreditation & Digital Compliance	L-T-P	Credits	Marks
PEL	DH6008		3-0-0	3	100

Objectives	This course aims to provide in-depth knowledge of healthcare accreditation standards and digital compliance requirements, focusing on implementing accreditation frameworks, ensuring regulatory compliance, and aligning digital systems with quality and safety standards in healthcare organizations.
Pre-Requisites	Knowledge and understanding of healthcare quality management systems and hospital operations is required.
Teaching Scheme	Regular classroom lectures supported by accreditation manuals, audit scenarios, compliance case studies, and hospital accreditation exercises.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Healthcare Accreditation: Concept of Accreditation vs Certification, Importance of Accreditation in Healthcare Quality, Overview of Accreditation Bodies, Accreditation Lifecycle – Preparation, Assessment, Certification, Renewal; Challenges in Accreditation Implementation.	8 Hours
Module-2	NABH Standards & Implementation: Overview of National Accreditation Board for Hospitals and Healthcare Providers (NABH), NABH Chapters and Structure; Key Areas – Patient rights, Care of patients, Management of medication, Hospital infection control; Documentation and SOP requirements; Implementation approach for NABH Accreditation.	10 Hours
Module-3	JCI & Global Accreditation Standards: Overview of Joint Commission International (JCI), JCI Standards and Patient Safety Goals; Comparison – NABH vs JCI (high-level); International Best Practices in Accreditation, Global Quality Benchmarking.	10 Hours
Module-4	Digital Compliance in Healthcare Systems: Concept of Digital Compliance, NABH Digital Health Standards, Electronic Medical Records (EMR) Compliance Requirements, Audit Trails, Data Integrity, and Documentation; Regulatory Alignment – ABDM, DPDP.	8 Hours
Module-5	Audits, Certification & Continuous Compliance: Internal and External Audits, Audit Preparation and Documentation Review, Non-Conformities and Corrective Actions, Continuous Monitoring and Re-accreditation, Case Study – Accreditation journey of a hospital.	6 Hours
Total		42 Hours

Text Books:

- T1. Joint Commission International, *Hospital Accreditation Standards: A Practical Guide*, Latest Edition, JCI, 2021.
- T2. G. J. Gyani and A. Thomas, *Handbook Of Healthcare Quality & Patient Safety*, 3rd Edition, Jaypee Brothers Medical Publishers, 2021.

Reference Books:

- R1. NABH, *NABH Accreditation Standards for Hospitals*, Latest Edition, NABH, 2023.

R2. JCI, *JCI Accreditation Standards for Hospitals*, Latest Edition, JCI, 2021.

R3. Koita Foundation, *NABH Digital Health Standards*, Latest Edition, NABH, 2023–2025.

Online Resources:

1. https://www.researchgate.net/publication/262895984_A_case_study_on_quality_management_and_digital_innovation_Relationship_and_learning_aspects: A case study on quality management and digital innovation
2. <https://bmjopen.bmj.com/content/9/2/e024514>: Impact of repeated hospital accreditation surveys on quality and reliability
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the concept, importance, and lifecycle of healthcare accreditation.
CO2	Interpret NABH standards, structure, and implementation in healthcare organizations.
CO3	Compare JCI and NABH accreditation standards and global quality practices.
CO4	Evaluate digital compliance requirements and standards in healthcare systems.
CO5	Analyze audit processes and continuous compliance in healthcare accreditation.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	1	2	2	3		3	2	2	3	2	1
CO2	2	2	1	1	1	1		2	1	3	2	1	1
CO3	3	3	1	3	2	3		3	2	2	3	1	1
CO4	2	2	1	2	2	3		3	2	2	3	2	2
CO5	2	1	1	2	1	2		2	1	2	2	1	1

Category	Code	Technology Innovation in Healthcare	L-T-P	Credits	Marks
PEL	DH6002		3-0-0	3	100

Objectives	This course aims to develop an innovation-driven mindset in healthcare by exploring emerging technologies, digital disruption, and new care delivery models. The course focuses on identifying innovation opportunities, evaluating technology trends, and applying product and platform thinking in healthcare.
Pre-Requisites	Understanding of digital healthcare systems, AI concepts, and healthcare operations is required.
Teaching Scheme	Regular classroom lectures supported by innovation case studies, startup ecosystem analysis, product design exercises, and trend exploration discussions.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Concepts & Frameworks: Innovation Types - Incremental vs disruptive innovation, Digital Disruption in Healthcare – Changing care delivery models, Innovation Frameworks – Design thinking, Lean innovation; Barriers to Innovation – Regulation, Adoption resistance, Scalability; Global Case Studies – Digital-first healthcare models.	8 Hours
Module-2	Emerging Technologies: Internet of Medical Things (IoMT), Wearables and Remote Monitoring Systems, Blockchain in Healthcare, Digital Therapeutics (DTx), Virtual Care and Telehealth Evolution.	10 Hours
Module-3	Healthcare Innovation Adoption: Innovation Adoption Frameworks – Technology adoption lifecycle, Diffusion of innovation in healthcare; Change in Care Delivery Models – Hospital-centric, Patient-centric, Home care; Digital Health Ecosystems – Platforms, Marketplaces, Integrated care models; Scaling Innovation – From pilot to enterprise-wide adoption, Challenges in scaling healthcare innovation.	10 Hours
Module-4	Startup Ecosystem & Innovation Management: Healthcare Startup Landscape – India and global; Innovation Ecosystems – Incubators, Accelerators; Business Models in Digital Health – B2B, B2C, B2G; Funding and Scaling – VC, partnerships; Corporate Innovation – Innovation labs in hospitals.	6 Hours
Module-5	Future of Healthcare & Disruptive Trends: Smart Hospitals and Autonomous Systems, Digital twins in healthcare, Precision and personalized medicine, Convergence of technologies (AI + IoT + Platforms), Future Care Models – Virtual-first, Home-based healthcare.	8 Hours
Total		42 Hours

Text Books:

- T1. C. M. Christensen, J. H. Grossman, J. Hwang, *The Innovator's Prescription: A Disruptive Solution for Health Care*, 1st Edition, , McGraw-Hill, 2016.
- T2. R. E. Herzlinger, *Who Killed Health Care? America's \$2 Trillion Medical Problem And the Consumer-Driven Cure*, 1st Edition, McGraw-Hill, 2007.

Reference Books:

- R1. E. Topol, *The Patient Will See You Now*, 1st Edition, Basic Books, 2016.
 R2. D. L. Rogers, *The Digital Transformation Playbook*, 1st Edition, Columbia Business School, 2016.

Online Resources:

1. <https://www.deloitte.com/us/en/insights/industry/health-care/digital-health-technology.html>: Digital health technology - Global case studies of health care transformation, Deloitte.
2. https://livrepository.liverpool.ac.uk/3165748/1/200230473_Sep22.pdf: The role of Innovation Hubs in supporting collaborative innovation: A case study of user-led healthcare innovation, 2022
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain innovation frameworks and digital disruption in healthcare.
CO2	Evaluate emerging technologies in healthcare and their applications.
CO3	Analyze innovation adoption frameworks and digital health ecosystems.
CO4	Assess healthcare startup ecosystems and innovation strategies.
CO5	Evaluate future trends in digital healthcare and disruptive healthcare models.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	3	2	2	3		3	2	2	3	2	1
CO2	2	1	1	2	2	2		2	1	1	2	1	1
CO3	3	3	1	2	2	3		3	2	2	3	2	2
CO4	2	2	2			2		2	2	2	2	2	2
CO5	3	2	2	3		2		2	1	2	2	1	1

Category	Code	Smart Hospitals & IoT Applications	L-T-P	Credits	Marks
PEL	DH6010		3-0-0	3	100

Objectives	This course aims to provide an understanding of smart hospital concepts and the application of Internet of Things (IoT) technologies in healthcare. The course focuses on connected devices, real-time monitoring, automation, and intelligent systems to improve operational efficiency and patient care.
Pre-Requisites	Knowledge and understanding of healthcare systems, digital healthcare technologies, and system integration & interoperability concepts is required.
Teaching Scheme	Regular classroom lectures supported by case studies, IoT use-case demonstrations, smart hospital models, and real-world applications.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Smart Hospitals: Concept of Smart Hospitals; Evolution from Digital to Smart Healthcare Systems; Key Components – Connected devices, Automation, Analytics; Benefits – Efficiency, Safety, Patient experience; Challenges in Smart Hospital Adoption.	8 Hours
Module-2	IoT in Healthcare: Overview of IoT in Healthcare (IoMT); Types of IoT Devices – Wearables, Sensors, Monitoring systems; Connected Medical Devices – ICU monitors, Smart beds; Data Collection and Real-Time Monitoring; IoT Architecture (High-level, Application-focused).	9 Hours
Module-3	IoT Applications in Hospital Operations: Patient Monitoring Systems (Remote and in-hospital); Asset Tracking and Equipment Management; Smart Bed and Ward Management Systems; Environmental Monitoring (temperature, hygiene, infection control); Workflow Automation using IoT Devices.	8 Hours
Module-4	Smart Clinical & Patient-Centric Care: Remote Patient Monitoring (RPM); Tele-ICU and Connected Care Models; Personalized Care using Connected Devices; Patient Safety Systems (alerts, fall detection); Home-based Care and Continuum of Care Models.	9 Hours
Module-5	Privacy by Design & Future Trends: Privacy by Design Principles; Secure System Implementation Practices; Security in Interoperable Systems (APIs and integrations); Emerging Trends: AI security, IoT security, Zero-trust architecture; Case Studies – Healthcare cyber attacks and lessons learned.	8 Hours
Total		42 Hours

Text Books:

- T1. P. Raj and A. Raman, *The Internet of Things in Healthcare: An Overview*, 1st Edition, Springer, 2017.
T2. S. Misra et. al., *Healthcare Internet of Things: Challenges and Solutions*, 1st Edition, Springer, 2020.

Reference Books:

- R1. S. H. Islam and D. Samanta, *Smart Healthcare Design and Applications*, 1st Edition, Wiley, 2020.
R2. HIMSS, *Smart Hospital and IoT Implementation Reports*, Latest Edition, HIMSS, 2022-2024.

Online Resources:

1. https://www.oecd.org/en/publications/measuring-the-internet-of-things_021333b7-en/full-report/component-9.html: by OECD, 2023
2. <https://spaces.cisco.com/what-is-a-smart-hospital/>: by Ryan Peppin, 2025
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe smart hospital concepts, components, benefits, and adoption challenges.
CO2	Explain IoT technologies, devices, and real-time monitoring applications in healthcare systems.
CO3	Explore IoT applications for patient monitoring, asset tracking, and workflow automation.
CO4	Assess smart patient-centric care models using connected devices and remote monitoring.
CO5	Evaluate security, integration, and future trends in smart hospital ecosystems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2		2	2	2	2	2	2
CO2	3	2	3	2	1	2		2	1	1	2	1	1
CO3	2	2	2	2	1	2		2	1	2	2	1	1
CO4	2	1	1	2	2	3		2	1	1	2	1	1
CO5	2	2	2	2	1	2		2	1	1	2	1	1

Category	Code	Healthcare Outcomes & Value-Based Care	L-T-P	Credits	Marks
PEL	DH6011		3-0-0	3	100

Objectives	The objective of this course is to provide an understanding of healthcare outcomes measurement and value-based care models. The course focuses on improving patient outcomes, optimizing resource utilization, and transitioning from volume-based to value-based healthcare delivery.
Pre-Requisites	Knowledge and understanding of healthcare systems, quality management, and patient care processes is required.
Teaching Scheme	Regular classroom lectures supported by outcome measurement frameworks, case studies, healthcare models, and value-based care scenarios.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Concept of Healthcare Outcomes; Types of Outcomes – Clinical, Patient-reported, Operational; Outcome vs Output vs Process; Importance of Outcomes in Healthcare Quality; Global Trends in Outcome Measurement.	8 Hours
Module-2	Outcome Measurement Frameworks: Key Outcome Metrics in Healthcare; Patient-Reported Outcome Measures (PROMs); Patient-Reported Experience Measures (PREMs); Standardization of Outcome Measurement; Benchmarking Outcomes Across Healthcare Organizations.	10 Hours
Module-3	Value-Based Healthcare (VBHC): Concept of Value-Based Care; Porter's Value-Based Healthcare Model; Outcome vs Cost Relationship; Care Pathways and Bundled Care Models; Transition from Fee-for-Service to Value-Based Care.	8 Hours
Module-4	Implementation of VBHC Models: Designing Value-based Care Programs; Integrated Care Delivery Systems; Role of Digital Health in Value-based Care; Outcome Tracking and Continuous Improvement; Challenges in Implementing VBHC (India and Global).	8 Hours
Module-5	Outcomes, Policy and Future Models: Healthcare Policy and Value-Based Reimbursement Models; Population Health Management; Outcome-based Contracts and Payment Models; Digital Health and Outcome Optimization; Future of Healthcare – Outcome-driven ecosystems.	8 Hours
Total		42 Hours

Text Books:

- T1. M. E. Porter and E. O. Teisberg, *Redefining Health Care: Creating Value-Based Competition on Results*, 1st Edition, Harvard Business School Press, 2006.
- T2. G. J. Gyani and A. Thomas, *Handbook Of Healthcare Quality & Patient Safety*, 3rd Edition, Jaypee Brothers Medical Publishers, 2021.

Reference Books:

- R1. World Health Organization, *Health System Performance and Outcome Measurement Reports*, Latest Edition, WHO, 2020–2023.

- R2. Organisation for Economic Co-operation and Development, *Health Outcomes and Value-Based Care Reports*, Latest Edition, OECD, 2021–2024.
- R3. Institute for Healthcare Improvement, *Outcome Measurement and Value-Based Care Frameworks*, Latest Resources, IHI, 2022–2024.

Online Resources:

1. <https://www.pwc.com/m1/en/publications/documents/value-based-healthcare.pdf>: PwC
2. https://abdm.gov.in/strapicms/uploads/VBHC_Policy_Document_For_Upload_a20f871a55.pdf: Volume-based to Value-based Care (AB PM-JAY, 2022)
3. Selected research articles from various scientific journals.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain healthcare outcomes and their importance in quality improvement.
CO2	Apply outcome measurement frameworks such as PROMs and PREMs.
CO3	Analyze value-based healthcare models and care delivery systems.
CO4	Evaluate implementation strategies for value-based care.
CO5	Assess policy, reimbursement models, and future trends in outcome-driven healthcare.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO5	Integrate diverse tools of health informatics, data analytics, information systems, and healthcare management to support digital transformation in modern hospitals.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO7	Work with professional context with intellectual integrity, ethics and social responsibility.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	1	3	1	2	3	2	2
CO2	3	2	1	2	1	3	2	3	1	2	3	2	2
CO3	3	2	1	3	2	3	1	3	2	2	3	2	1
CO4	2	1	1	2	1	2	1	1	1	1	2	1	1
CO5	2	2	1	2	1	1	2	1	1	1	2	1	1

Category	Code	Hospital Digital Maturity Assessment Lab	L-T-P	Credits	Marks
PCR	DH6003		0-0-4	2	100

Objectives	The objective of this laboratory course is to provide hands-on experience in assessing the digital maturity of healthcare organizations using structured frameworks.
Pre-Requisites	Knowledge of digital healthcare systems, transformation frameworks, and performance intelligence concepts is required.
Teaching Scheme	Regular laboratory sessions involving maturity assessment exercises, case studies, framework-based evaluations, and report preparation.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Introduction to digital maturity models in healthcare (global and India context).
2-4	Understanding PPTI framework for maturity assessment.
5-6	Defining maturity levels of hospital.
7-8	Assessing People dimension: skills, adoption, training, and governance.
9-10	Assessing Process dimension: workflow standardization, SOPs, and digitization level.
11-12	Assessing Technology dimension: HIS, EMR, AI, integration level.
13	Assessing Infrastructure dimension: IT infrastructure, cloud, and network readiness.
14	Evaluating interoperability and data exchange maturity (ABDM alignment).
15-17	Assessing digital patient engagement capabilities (apps, portals, and telehealth).
18-20	Evaluating data governance, privacy, and compliance (DPDP alignment).
21-22	Scoring and benchmarking maturity levels across departments.
23-24	Gap analysis and identification of improvement areas.
25-26	Developing digital maturity assessment report with recommendations.
27-28	Final project: End-to-end digital maturity assessment of a hospital.

Text Books:

- T1. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.
- T2. HIMSS, *Digital Health Indicator: Measure Your Healthcare Outcomes*, Latest Edition, 2022.

Reference Books:

- R1. D. L. Rogers, *The Digital Transformation Playbook: Rethink Your Business for the Digital Age*, 1st Edition, Columbia Business School Publishing, 2016.
- R2. G. C. Kane, et. al., *The Technology Fallacy: How People Are the Real Key to Digital Transformation*, 1st Edition, MIT Press, 2019.

Online Resources:

1. <https://gdhp.health/wp-content/uploads/2025/10/GDHP-Framework-for-Selecting-Digital-Health-Maturity-Assessments.pdf>: by Dr. T. Sunbul and Mr. P. O'Halloran, 2025

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain digital maturity concepts and assessment frameworks in healthcare.
CO2	Evaluate healthcare organizations across PPTI dimensions.
CO3	Analyze maturity gaps and benchmarking results.
CO4	Apply structured frameworks for digital maturity assessment.
CO5	Develop maturity assessment reports with strategic recommendations.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
PO3	Design innovative digital healthcare solutions and technology-enabled healthcare models to improve efficiency, patient outcomes, and healthcare service delivery.
PO4	Apply the skills in healthcare information systems, digital technologies, and analytics tools in hospitals and healthcare organizations to manage healthcare operations effectively.
PO6	Function effectively as an individual or as a member of a multidisciplinary team with professional and managerial skills.
PO8	Communicate effectively and present technical information in oral and written reports supported by diagrams and models for easy visualization.
PO9	Review research literature and emerging technologies in digital health, healthcare analytics, and health informatics to develop innovative solutions for the healthcare industry.
PO10	Recognize the need for continuous learning and professional development in digital health technologies, healthcare systems management, and healthcare innovation.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	2	3		3		3		3	3	2	2
CO2	3	2	2	2		3		3	1	3	3	2	2
CO3	2	1	1	2		2		2	1	2	2	1	1
CO4	3	2	2	2		2		2	2	1	2	1	1
CO5	1	1	1	1		2		2	2	2	2	1	1

Category	Code	Digital Healthcare Operations & Quality Lab	L-T-P	Credits	Marks
PCR	DH6004		0-0-4	2	100

Objectives	The objective of this laboratory course is to provide hands-on experience in managing and optimizing digital healthcare operations while applying quality frameworks and accreditation standards.
Pre-Requisites	Knowledge of healthcare workflows, digital systems, and healthcare quality management concepts is required.
Teaching Scheme	Regular laboratory sessions involving case studies, operational simulations, quality assessment exercises, and healthcare scenario-based problem solving.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1-2	Introduction to digital healthcare operations and quality frameworks.
3-5	Overview of JCI, NABH digital standards and quality requirements.
6	Evaluating OPD digital operations for efficiency and patient flow.
7-8	Evaluating IPD operations: admission, care delivery, and discharge processes.
9-10	Assessing diagnostic services (lab and radiology) for TAT and quality.
11-12	Pharmacy operations: digital prescription, dispensing accuracy, and audit.
13-14	Patient experience measurement using digital feedback systems.
15-16	Monitoring operational KPIs for quality improvement (TAT, ALOS, and waiting time).
17-18	Incident reporting systems and digital patient safety mechanisms.
19-20	Root Cause Analysis (RCA) and Corrective and Preventive Action (CAPA).
21	Compliance assessment: data privacy, consent, and audit trails (DPDP alignment).
22-24	Infection control and safety monitoring using digital systems.
25-26	Designing a digital quality improvement plan for a hospital department.
27-28	Final project: End-to-end digital operations and quality assessment report.

Text Books:

- T1. R. C. McLaughlin and C. D. Kaluzny, *Continuous Quality Improvement in Health Care*, 5th Edition, Jones & Bartlett, 2013.
- T2. K. A. Wager, F. W. Lee, and J. P. Glaser, *Health Care Information Systems: A Practical Approach for Health Care Management*, 4th Edition, Jossey-Bass, 2021.

Reference Books:

- R1. National Accreditation Board for Hospitals, *Digital Health Standards*, Latest Edition, NABH, 2023.
- R2. World Health Organization, *Quality of Care Framework*, Latest Edition, WHO, 2018.
- R3. Joint Commission International, *Accreditation Standards for Hospitals*, 8th Edition, JCI, 2025.

Online Resources:

1. <https://www.facs.org/quality-programs/qi-resources/case-studies/>: Quality Improvement Case Study Repository - A collection of QI projects from hospitals participating in ACS Quality Programs.

2. <https://www.cms.gov/priorities/innovation/files/x/ahcm-casestudy-stjoseph.pdf>: Using Data for Quality Improvement: A Case Study from St. Joseph's Hospital Health System
3. Selected research articles from various scientific journals.

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

CO1	Evaluate digital healthcare operations across clinical and support services.
CO2	Apply NABH digital standards and quality frameworks in healthcare settings.
CO3	Analyze operational KPIs and patient experience for quality improvement.
CO4	Apply patient safety and incident management approaches in digital systems.
CO5	Develop digital operations and quality improvement plans for healthcare organizations.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of healthcare systems, digital health technologies, data analytics, and healthcare management principles to design and support modern healthcare delivery systems.
PO2	Develop various methods and analytical approaches to manage digital platforms, information systems, and healthcare data for improved clinical and operational decision making.
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CO1	3	2	2	1		3		3	1	2	3	2	2
CO2	3	2	2	2		3		3	1	2	3	2	2
CO3	3	2	2	2	2	2		2	1	2	2	2	1
CO4	3	3	3	2		3		3	2	1	3	1	1
CO5	2	1	1	1		2		2	2	2	2	1	1



**Department of Integrated Healthcare Technology
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