राष्ट्रीय प्रौद्योगिकी संस्थान पटना / NATIONAL INSTITUE OF TECHNOLOGY PATNA
संगणक विज्ञान एंव अभियांत्रिकी विभाग / DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
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**No:-** **Date:**

***CSXX1930 Health Informatics*** **L-T-P-Cr: 3-0-0-3**

**Pre-requisites:** Fundamental knowledge Machine Learning

**Objectives/Overview:**

1. To introduce the basics of Health Informatics
2. To introduce the different modalities of medical imaging.
3. To introduce computational models and its application in health care applications
4. To introduce state of the art applications in medical and personal care

**Course Outcomes:**

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

**CO 1:** Knowledge of basic and advanced Health Informatics.

**CO 2:** Identification of suitable learning tasks to which these learning techniques can be applied.

**CO 3:** Appreciation of some of the current limitations of health informatics.

**CO 4:** Formulation of decision problems, set up and run computational experiments, evaluation of results from experiments.

**Course Outcomes–Cognitive Levels–Program Outcomes Matrix – [H: High relation (3); M: Moderate relation (2); L: Low relation (1)]**

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO-1 Engineering knowledge | PO-2 (Problem analysis) | PO-3 Design/development of solutions) | PO-4 (Conduct investigations of complex problems) | PO-5 (Modern tool usage) | PO-6 (The engineer and society | PO-7 (Environment and sustainability) | PO-8 (Ethics) | PO-9 (Individual and team work) | PO-10 (Communication) | PO-11 (Project management and finance) | PO-12 Life-long learning) |
| CO-1 | 3 | 3 | 3 | 3 | 2 | 3 | | | 3 | 3 | 1 | 3 |
| CO-2 | 3 | 3 | 3 | 3 | 2 | 3 | | 1 | 3 | 3 | 1 | 3 |
| CO-3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 1 | 3 |
| CO-4 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 1 | 3 |

**UNIT 1** **Lecture 6**

Introduction: Modeling Healthcare Information, Medical Informatics, Computational Health Informatics, Records in database, Modeling Graphs, Time-Series Data, Modeling Multimedia

Feature Space, Similarity-Based Search Techniques, Modeling Time, Human Physiology, Genomics and Proteomics

**UNIT 2** **Lecture 12**

Intelligent Data Analysis Techniques: Dimension Reduction, Heuristic Search Techniques, Inferencing Techniques, Machine Learning, Data Mining, Interoperability and Ontology, Intelligent Interfacing Techniques

Healthcare Data Organization: Modeling Medical Data, Automated Data Acquisition and Interfaces, Health Information Flow, Electronic Medical Records, Heterogeneity in Medical Databases, Information Retrieval, Interoperability and Standardizations, Standard for Transmitting Medical Information

**UNIT 3** **Lecture 12**

Medical Imaging Informatics: Radiography, Computed Tomography, Magnetic Resonance Imaging, Ultrasound, Nuclear Medicine, Alternate Modalities, Medical Image Analysis, Computer-Aided Diagnosis

Medical Image Communication: Modeling Medical Imaging Information Using DICOM, Types of DIMSE (DICOM Messaging Service), Verification Service, Storage Services, Storage Commitment Service, Query/Retrieval Service, Search and Retrieval Process, Medical Image Security

Bioelectric and Biomagnetic Signal Analysis: Electrocardiograph (ECG) Fundamentals, ECG Analysis, Heart Diseases and ECG, Computational Techniques for Detecting Heart Diseases, Electroencephalography (EEG), Magnetoencephlography (MEG), Elecromyography (EMG)

**UNIT 4** **Lecture 12**

Clinical Data Analytics: Clinical Data Classification, Biostatistics in Clinical Research, Randomized Clinical Trials, Survivability and Risk Analysis, Clinical Decision Support System, Clinical Process Mining, Disease Management and Identification

Pervasive Health and Remote Care: Pervasive Healthcare Taxonomy, Wearable Health-Monitoring Systems, Patient Care Coordination, Home-Based Monitoring, Healthcare Network and Interfaces, Acceptance and Adoption

Disease Prediction and Drug Development: Genomics, Proteoemics and Pathways, Genome Analysis Tools, Genome and Proteome Analysis, Drug Development, Immunoinformatics – Vaccine Development, Pharmacokinetics and Pharmacodynamics

**Text Books:**

1. Arvind Kumar Bansal, Javed Iqbal Khan, S. Kaisar Alam, Introduction to Computational Health Informatics, Chapman & Hall/CRC, 1st Edition

Reference Books:

2. Homero Rivas, Thomas Boillat, Digital Health: From Assumptions to Implementations. Springer 2023.