JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	L	T/P/D	C
	4	-/-/-	4

(A80241) RELIABILITY ENGINEERING
(Elective-III)

Unit - I

Basic Concepts of Reliability: Introduction, Reliability and quality, Failures and failure modes ,Causes of failures and reliability, Maintainability and availability, History of reliability ,reliability literature.

Unit-II

Reliability Mathematics: Introduction, Random experiment , Probability , Random variables, Distribution functions, Discrete distribution ,Continuous distribution, Numerical characteristics of random variables , Laplace transform.

Component Reliability and Hazard Models: Introduction, Component reliability from test data, Mean time to failure, Time – dependent hazard models, Stress- Dependent hazard models , Derivation of reliability function using Markov, Treatment of field data.

Unit-III

System Reliability Models: Introduction - Systems with series components - Systems with parallel components - k-out – of- m systems - Non series parallel systems - Systems with - mixed – mode failures - Fault-tree technique

Unit-IV

Maintainability and Availability Concepts: Introduction - Maintainability function - Availability function - Frequency of failures -- Two-unit parallel systems with repair - k-out-of-m systems - Preventive maintenance.

Reliability Improvement: Introduction - Improvement components - Redundancy - Element redundancy - Unit redundancy - Stand by redundancy - Optimization - Reliability – cost trade – off .

Unit-V

Economics of Reliability Engineering: Economic issues -Manufacture's cost- Customer's cost - Reliability achievement cost – models - Reliability utility cost models - Depreciation cost models - Availability – cost – model of parallel systems.

Reliability Management: Reliability programming - Management policies and decision - Reliability management by objectives - Reliability group - Reliability data : Acquisition and analysis - Managing people for reliability

TEXT BOOKS :
1. Reliability Evaluation of Engineering Systems. R. Billington, RN Allan, BS Publications 2007.
2. Reliability, Maintenance and safety Engineering - Dr. A.K. Gupta, Laxmi Publications.

REFERENCE BOOKS:

1. Reliability Engineering- Patrick DTO-Wiley India.
2. Reliability Engineering and life testing –Naikan-PHI.
3. Engineering Maintenance a Modern Approach, B.S.Dhillon,2002 CRR Publications.
4. Maintenance Engineering and Management – RC Misra, PHI.
5. Reliability Engineering – Balaguruswamy- TMH.
6. Reliability Engineering- L.S.Srinath.

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(A81121) TRANSPORTATION PHENOMENA IN LIVING SYSTEMS
(Elective – III)

The **course objective** is to make the learner understand

- The fundamental conservation principles and laws that govern heat, mass and momentum transport processes and systems and constitutive properties that are encountered in typical biological problems.

- The principles to biomedical applications such as oxygen transport from the lungs, blood transport by cardiovascular system, and mass transfer of solutes in the renal tubules in the kidney.

UNIT-I

Heat Transport: Body temperature regulation modes of heat transfer, processes of Head loss and heat gain from the human body. Heat transportation in Tissues, Muscles, Skin and other Organs in different environmental temperatures. Models of heat transfer in the body.

UNIT-II

Fundamentals and applications of mass transport. Introduction to Mass Transport. Diffusion with Convection or Electrical Potentials. Transport in Porous Media. Trans vascular Transport. Solvent and Solute Transport across the Kidney Glomerulus.

UNIT-III

Processes of mass transfer Diffusion, Osmosis, Electro Osmosis. Ultra filtration. Reverse Osmosis through natural Membrane systems, Reverse Osmosis through artificial synthetic Membranes.

UNIT-IV

Mass Transport and Biochemical Interactions, Oxygen Transport from the Lungs to the Tissues.

UNIT-V

Mass transfer: Mass transfer in Kidney, Skeletal, Nervous, G. I. system, Cardio Pulmonary system. Mass transfer in Dialysers and Oxygenators.

TEXT BOOKS:

1. Fournier, Ronald L,.Basic transport phenomena in biomedical engineering. Taylor & Francis. 1998.

REFERENCES:

1. David.O. Cooney, Biomedical engg. Principles: An introduction to fluid, Heat & Mass transport process Vol & 2 ; Marcel Dekker inc,.
2. Medical physiology by Ganong.
3. Physiology by Best and Taylar. www.universityupdates.in

Course Outcomes:

At the end of this course, the learner will be able to

*   Explain the heat, gas and mass transport in biological systems.
*   Apply knowledge of biological and physical sciences, mathematics, and engineering to solve problems at the interface of engineering and biology.
*   Solve a number of key problems in biomedical engineering involving various forms of transport phenomenon.

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(A81120) TELEMEDICINE
(Elective-III)

The **course objective** is to make the learner understand

- The fundamental concepts and technologies associated with telemedicine.
- The implementation of telemedicine networks.
- How technology and e-health services can be exploited strategically to create new ways of working together.
- Realize the importance of the global standards in the field of telemedicine.

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Unit-I:

History of telemedicine, Block diagram of telemedicine system, Definition of telemedicine, Tele health, Tele care, organs of telemedicine, scope, Benefits, and limitations of telemedicine. Type of information; Audio, Video, Still images, Text and data, fax, type of communications and network, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications: GSM satellite and Micro wave. Different Modulation techniques. Types of antennas depending on requirements, Integration and operational issues: system integration, store –and - forward operation, Real-time Telemedicine.

Unit –II:

Data Exchange: Network Configration, circuit and packet switching, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN). Video Conferencing. Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Ecryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7.

Unit – III:
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Ethical and legal aspects of Telemedicine: Confidentiality, and the law, patient rights and consent, access to medical Records, Consent treatment, jurisdictional Issues, Intellectual property rights.

Unit – IV:

Tele radiology: Definition, Basic parts of Tele-radiology system: Image Acquisition system Display system, Communication network, Interpretation section. Tele pathology: multimedia databases, color images of sufficient resolution: Dynamic range, spatial resolution, compression methods, Interactive control of color, Controlled sampling security and confidentiality tools.

Unit – V

And Tele-Cardiology Tele-Oncology, Tele-Surgery. Applications of Tele-Surgery.

TEXTBOOKS:

1. Olga (EDT) Ferrer – Roca, M.Sosa (EDT) Iudicissa Hand book of Telemedicine IOS press 2002.
2. A.C. Norris, Essentials of Telemedicine and Telecare John Sons & Ltd, 2002.

Course Outcomes:

At the end of this course, the learner will be able to

- Demostrate Knowledge on current Telemedicine Technologies.
- Implement the process of telemedicine networks.
- Conduct an effective telemedicine consultation.

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(A80357) ROBOTICS AND AUTOMATION
(Elective-IV)

OBJECTIVES:

i. To study the various parts of robots and fields of robotics.

ii. To study the various kinematics and inverse kinematics of robots.

iii. To study the Euler, Lagrangian formulation of Robot dynamics.

iv. To study the trajectory planning for robot.

v. To study the control of robots for some specific applications.

UNIT-I

Basic Concepts : Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

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UNIT- II

Power Sources And Sensors : Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT- III

Manipulators, Actuators and Grippers : Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT-IV

Kinematics and Path Planning : Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages.

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UNIT-V

Case Studies : Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 1996.

2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.

2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.

3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.

4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.

5. Issac Asimov I Robot, Ballantine Books, New York, 1986.
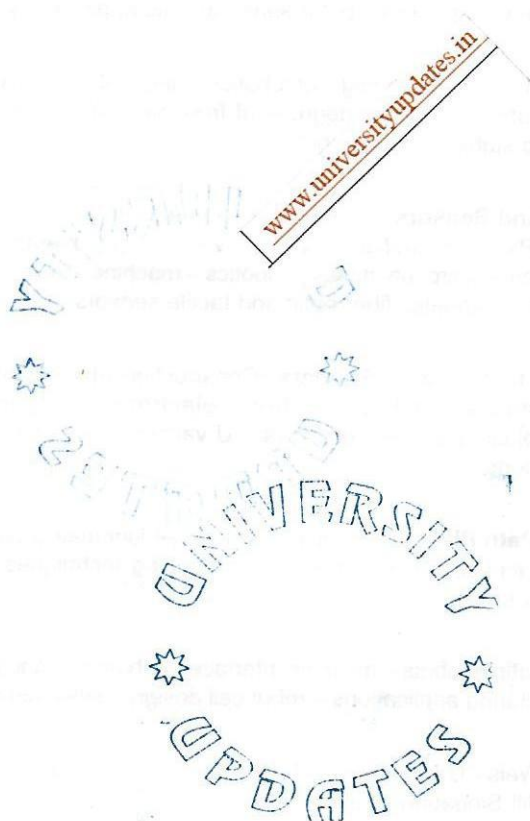
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IV Year B.Tech. BME-II Sem

	L	T/P/D	C
	4	-/-/-	4

(A81119) MEDICAL INFORMATICS
(Elective-IV)

The **Course Objective** is to make the learner understand

- The fundamental concepts of a medical information system in modern world.
- Transforming patient data into medical information using classification and coding systems.
- The decision support, information and information security systems in hospitals.
- The organization of health information to support action.

UNIT-I

Introduction and Overview of hospital information system. Patient history taking mechanisms. Patient Data Processing, Database Management, Communication of Medical data across different hospital units. Networking and Integration of patient data.

UNIT-II

Data from Patients, Coding and Classification, The Patient Record, Biosignal Analysis, Medical Imaging, Image Processing and Analysis. Patient-Centered Information Systems, Primary Care, Clinical Departmental Systems, Clinical Support Systems, Nursing Information Systems.

UNIT-III

Medical Knowledge and Decision Support, Methods for Decision Support, Clinical Decision-Support Systems, Strategies for Medical Knowledge Acquisition, Predictive Tools for Clinical Decision Support.

UNIT-IV

Institutional Information Systems, Modeling of Health Care for Information Systems Development, Hospital Information Systems: Clinical Use, Technical Choices, Health Information Resources. Methodology for Information Processing, Logical Operations, Biostatistical Methods, Biosignal Processing Methods, Pattern Recognition, Modeling for Decision Support, Structuring the Computer-based Patient Record, Evaluation of Clinical Information Systems.

UNIT-V

Methodology for Information Systems: Human-Computer Interaction in Health Care ,Costs and Benefits of Information Systems, Security in Medical

Information Systems, Standards in Health-care Informatics and Telematics, Project Management.

TEXT BOOK

1. Bemmel, J.Van; Musen, M.A. Handbook of Medical Informatics 1st ed. 1997.

REFERENCES

1. R.D.Lele ,Computers in Medicine, Tata McGraw Hill, 2005.

2. Davidson, P., Best Practice Series: Healthcare Information Systems, Auerbach Publications, 2000.

3. Edward B.H. Shortliffe & James J Cimino- Biomedical Informatics – Computer Application in Health Care and Biomedicine. (New Age Int. P.Ltd.), 3rd Edition Springer-2008.

Course Outcomes

By the end of the course, the students will

- Acquire familiarity with core concepts in medical informatics including decision support systems in clinical environments and other health care settings.

- Be able to manage healthcare data in the context of emerging regulations.

- Develop software, networking, and communications within a health care context.

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(A81118) BIOMETRIC SYSTEMS
(Elective-IV)

The **Course Objective** is to make the learner understand

The fundamentals of biometric systems.

The technology and application of fingerprint identification.

The technology and applications of iris face and voice recognition.

UNIT I

Biometric Fundamentals : Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II   www.universityupdates.in

Fingerprint Identification Technology : History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.

UNIT III

IRIS Recognition : Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV

Face Recognition : Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition- Representation and Classification, Kernel-based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V   www.universityupdates.in

Voice Scan : Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.

TEXT BOOKS:

1.   James Wayman & Anil Jain, Biometric Systems – Technology, Design

and Performance Evaluation, Springer-verlag London Ltd, USA, 2005.

2. Sanir Nanavati, Michael Thieme, Biometrics Identity Verification in a Networked world, Wiley Computer Publishing Ltd, New Delhi, 2003.

REFERENCE:

1. John D. Woodword Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

Course Outcome

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- To gain a broader knowledge of biometric technologies.
- To understand differences among biometric technologies.
- To design a biometric systems.
- To evaluate biometric systems in real world applications.

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	4	-/-/-	4

(A81117) BIOMATERIALS

The **course objective** is to make the learner understand

- The basic biology types and of biomaterials.
- The tissue material interactions in vivo.
- The different types metallic, ceramic, polymeric and composite bio materials in biomedical applications like orthopedics , dentistry & in artificial organs.
- FDA rules and regulations. www.universityupdates.in

UNIT I

Classification of materials used in medicine, Properties of Materials.

UNIT-II

Host reactions to : Inflammation, Wound healing and the Foreign body response.

Systemic toxicity and Hypersensitivity. Blood coagulation and Blood-materials Interactions. Tumorigenesis. Testing biomaterials:In Vitro assessment of tissue compatibility In vivo assessment of tissue compatibility. Testing of blood-materials interactions.

Degradation of materials in the biological environment. Effects of the Biological environment on metals, polymers and ceramics.

UNIT-III

Applications of materials in medicine, Dentistry and Biology: Cardiovascular medical devices. Nonthrombogenic treatments and Strategies. Dental implantation adhesive and Sealants. Ophthalmologic applications-intraocular lens implants.

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UNIT-IV

Orthopedic biomaterials, Materials for fixation screws, plates, intramedullar nails. Sutures. Burn dressings and Skin substitutes. Artificial organs and tissues: Implantable cardiac assist devices. Materials for extracorporeal devices. Cochlear implants. Artificial red blood cell substitutes.

UNIT-V

Sterilization of implants and Devices implants and Device failure. Implant retrieval and Evaluation. Standards development and regulation of medical products using biomaterials. Nano bio materials.

TEXT BOOKS:

1. Biomaterials Science: An Introduction to Materials in Medicine Buddy D. Ratner, Frederick J. Schoen, Allan S. Hoffman, Jack E. Lemons.

2. Hench L L Ethridg E.C. Biomaterials, an interfacial approach, Academic press 1982.

REFERENCE:

www.universityupdates.in

1. Bronzino J D, The Handbook Biomedical Engineering, CRC Press.

Course Outcomes:

By the end of the course the students will be able:

*   Identify the biomaterials based on application types and sites.
*   Analyze different types of tissue material interactions.
*   Differentiate various biomaterials used in artificial organs, orthopedics and dentistry etc.
*   To know FDA rules and regulations.

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IV Year B.Tech. BME-IISem	L	T/P/D	C
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(A80087) INDUSTRY ORIENTED MINI PROJECT

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IV Year B.Tech. BME-II Sem	L	T/P/D	C
	-	-/6/-	2

(A80089) SEMINAR

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IV Year B.Tech. BME-II Sem	L	T/P/D	C
	-	-/15/-	10

(A80088) PROJECT WORK

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IV Year B.Tech. BME-II Sem	L	T/P/D	C
	-	-/-/-	2

(A80090) COMPREHENSIVE VIVA