



HINDUSTAN

INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

HONORS AND MINORS SPECIALIZATIONS

2018 REGULATIONS

HONORS APPLICABLE FOR B.Tech., B.Des, SLAAS PROGRAMMES

MINORS APPLICABLE FOR ALL PROGRAMMES

UNDER

HITS – COURSERA SKILL TRANSFORMATION PROGRAMME – HCST

- 1. HONOURS COURSES THROUGH COURSERA**
- 2. HONOURS COURSES OFFERED BY DEPT**
- 3. MINORS OFFERED THROUGH COURSERA**
- 4. MINORS OFFERED BY DEPARTMENT**
- 5. NON DEPARTMENT ELECTIVES THROUGH
COURSERA**
- 6. SPECIALIZATIONS, VALUE ADDED COURSES
THROUGH COURSERA**



7.0 B. Tech, / B.Des., / SLAAS (Honours) Programme

A new academic programme B. Tech, / B.Des., / SLAAS. (Hons.) is introduced in order to facilitate the students to choose additionally the specialized courses of their choice and build

their competence in a specialized area. The features of the new programme, include:

- a. B.Tech. students in regular stream can opt for B. Tech, / B.Des., / SLAAS (Hons) provided they have a CGPA of 8.0 up to the end of fourth semester without any history of arrears.
 - b. The students opting for this program have to take four additional courses of their specialization of a minimum of 3 credits each from 5th to 8th semesters with not more than 2 additional courses in a semester.
 - c. The list of such additional courses offered by the various Departments of the respective school will be announced in the beginning of the academic year to facilitate the registration process.
 - d. The student can also opt for post graduate level courses
 - e. The faculty advisor will suggest the additional courses to be taken by the students based on their choice and level of their academic competence.
 - f. Students who have obtained “E” or “U” or “RA” grade or “DE” category (vide clause 16.0 – Grading) in any course, including the additional credit courses, are not eligible for B. Tech, / B.Des., / SLAAS (Hons) degree.
 - g. The students have to pay the requisite fee for the additional courses.
- *A student can opt for only one Honors Specialization for the entire duration of the programme.*
 - *The successful student will be awarded the Degree Certificate with Hons specialization namely, “B.Tech in Computer Science and Engineering with Hons specialization in Network Security”*



8.0 Minor specialization:

Students, who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering / Technology/ Arts/ Fashion/ Humanities/ Management/ Basic Sciences, may opt for additional courses in minor specialization groups offered by a department other than their parent department. Such students shall select the stream of courses offered with pre – requisites by the respective departments and earn a Minor Specialization.

- a. The number of credits to be earned for Minor specialization is 12 credits.
 - b. The students are permitted to register for their minor specialization courses from the V semester onwards subject to a maximum of two additional courses per semester.
 - c. The list of such additional courses offered by the various departments and the schedule will be announced in the beginning of the academic year to facilitate the registration process.
 - d. The students have to pay the requisite fee for the additional courses.
- *A student can opt for multiple Minor specializations.*
 - *The student will be awarded Minor Specialization certificates along with the Degree Certificate upon successful completion.*

The list of Hons and Minors, NE, Specializations offered through Coursera and the Departments are listed in this document.



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HONOURS

GROUP 1

SCHOOL OF COMPUTING SCIENCE & SCHOOL OF ELECTRICAL SCIENCE

COURSERA:

1. PRODUCT AND SOFTWARE MANAGEMENT
2. COMPUTER ARCHITECTURE AND NETWORKS
3. CYBERSECURITY
4. DATA ENGINEERING ON CLOUD
5. BUSINESS ANALYTICS
6. TECHNOLOGY AND MIS MANAGEMENT
7. DATA STRUCTURES AND ALGORITHM
8. BIG STRUCTURES AND DATABASE SYSTEMS
9. DEEP LEARNING
- 10.INTERNET OF THINGS
- 11.MOBILE COMPUTING
- 12.TENSORFLOW
- 13.WEB DEVELOPMENT
- 14.WIRELESS SENSOR NETWORK GAME PROGRAMMING

DEPARTMENT OFFERED HONOURS:

- 1.SMART GRID
- 2.IOT EMBEDDED SYSTEMS
- 3.EMBEDDED SYSTEMS
- 4.ARTIFICIAL INTELLIGENCE
- 5.VIRTUALIZATION
- 6.ELECTRIC VEHICLES DESIGN



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GROUP 2

SCHOOL OF MECHANICAL SCIENCE & SCHOOL OF AERONAUTICAL SCIENCE

COURSERA

1. DIGITAL MANUFACTURING
2. ENERGY MANAGEMENT IN INDUSTRY
3. MATERIAL SCIENCE
4. MECHANICS OF MATERIALS
5. THERMODYNAMICS
6. VIBRATION AND ACOUSTICS
7. FOOD MICROBIOLOGY
8. GENETICS
9. PHARMACEUTICAL BIOTECHNOLOGY
10. PROJECT MANAGEMENT
11. RELIABILITY AND QUALITY CONTROL
12. SELF DRIVING CARS
13. SUPPLY CHAIN AND PROCUREMENT

DEPARTMENT OFFERED HONOURS

1. DESIGN
2. ENVIRONMENTAL HEALTH ENGINEERING
3. PROCESS ENGINEERING
4. GENETIC ENGINEERING
5. AIRCRAFT STRUCTURES
6. AERODYNAMICS
7. PROPULSION
8. AUTOTRONICS
9. MOTORSPORTS



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GROUP 3

SCHOOL OF BUILDING SCIENCE & SCHOOL OF DESIGN

COURSERA

1. ENGINEERING ECONOMICS AND MANAGEMENT
2. ENVIRONMENTAL ENGINEERING
3. SMART CITY AND INFRASTRUCTURAL ENGINEERING
4. SUSTAINABLE AND RENEWABLE ENERGY
5. WATER RESOURCE ENGINEERING

DEPARTMENT OFFERED HONOURS

1. ENVIRONMENTAL SYSTEMS
2. CONSTRUCTION MANAGEMENT
3. DISASTER MANAGEMENT

Minors in Biomedical Engineering

COURSE TITLE	BASIC HUMAN ANATOMY AND PHYSIOLOGY							CREDITS	3			
COURSE CODE	ECM4376		COURSE CATEGORY		Minors			L-T-P-S	3-0-0-0			
Version	1.0		Approval Details					LEARNING LEVEL	BTL-3			
ASSESSMENT SCHEME												
First Periodical Assessment	Second Periodical Assessment		Seminar/ Assignments/ Project		Surprise Test / Quiz			Attendance	ESE			
15%	15%		10%		5%			5%	50%			
Course Description	This course describes the basic understanding of the various parts of the human body, their anatomical position and their functions											
Course Objective	<ol style="list-style-type: none"> To know about the Functional organization of human body Cell and Blood Composition & Functions of blood. To learn about ECG and its importance. Structure of heart and Neurons . To learn about the Respiratory System and structure of the skeleton . To study about the digestive and excretory system . To learn about the Physiology of ear and eyes and endocrine Glands 											
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> Relate basic human body functions and life processes Enumerate the major components of cardiac and nervous system and describe briefly their physiological functions Elucidate the major components of respiratory and muscular system and describe briefly their physiological functions Identify the major components of digestive and excretory system and describe briefly their anatomical locations, structures and their physiological functions Describe the functions of eye, ear, and endocrine glands . 											
Prerequisites: NIL												
CO, PO AND PSO MAPPING												
CO	PO - 1	PO-2	PO-3	PO- 4	PO- 5	PO- 6	PO- 7	P O -8	PO-9	PO -10	PO-11	PO-12
CO-1	2	-	-	-	-	1	-	-	-	-	-	2

CO-2	2	-	-	2	-	1	-	-	-	2	-	2
CO-3	2	-	-	2	-	1	-	-	-	1	1	2
CO-4	2	-	-	-	-	1	-	-	-	-	-	2
CO-5	2	-	-	2	-	1	-	-	-	1	1	2
1: Weakly related, 2: Moderately related and 3: Strongly related												
MODULE 1: CELL AND NEURONS												(9)
Structure of Cell – Organelles and description – Function of each component of the cell – Membrane potential –Action Potential – Generation and Conduction – Electrical Stimulation. Blood Cell – Composition – Origin of RBC – Blood Groups – Estimation of RBC, WBC and Platelet.												CO-1 BTL-2
MODULE 2: CARDIAC AND NERVOUS SYSTEM												(9)
Heart, Major blood vessels – Cardiac Cycle – ECG – Blood Pressure – Feedback Control for Blood Pressure –Nervous Control of Heart - Cardiac output – Coronary and Peripheral Circulation – Structure and function of Nervous tissue – Neuron - Synapse - Reflexes - Receptors -Brain -Brainstem -Spinal cord – Reflex action – Velocity of Conduction of Nerve Impulses - Electro Encephalograph – Autonomous Nervous System.												CO-2 BTL-3
MODULE 3: RESPIRATORY SYSTEM AND MUSCULAR SKELETAL SYSTEM												(9)
Physiological aspects of respiration – Trachea and lungs - Exchange of gases – Regulation of Respiration - Disturbance of respiration function - Pulmonary function test - Muscles - tissue - types - structure of skeletal muscle - types of muscle and joints.												CO-3 BTL-3
MODULE 4: DIGESTIVE AND EXCRETORY SYSTEM												(9)
Organisation of GI System, Digestion and absorption – Movements of GI tract – Intestine - Liver - Pancreas - Structure of Nephron – Mechanism of Urine formation – Urine Reflex – Skin and Sweat Gland – Temperature regulation.												CO-4 BTL-3
MODULE 5: EYE, EAR, ENDOCRINE GLANDS												(9)
Optics of Eye – Retina – Photochemistry of Vision – Accommodation - Neurophysiology of vision – EOG. Physiology of internal ear – Mechanism of Hearing – Auditory Pathway, Hearing Tests - Endocrine glands, Sensory and Pituitary glands												CO-5 BTL-3
TEXT BOOKS												
1.	H. S. Ravi Kumar Patil, H. K. Makari, H. Gurumurthy, S. V. Sowmya (2013), <i>Text Book of Human Physiology</i> I K International Publishing House Pvt. Ltd, pp. 1 – 224.											
2.	Ranganathan, T.S. (2000), <i>Text Book of Human Anatomy</i> , S.Chand &Co. Ltd., Delhi, pp. 1- 796.											
REFERENCE BOOKS												

1.	Roberto Osti., (2016), <i>Basic Human Anatomy</i> , The Monacelli Press, LLC, Delhi, pp. 1-304
2.	Arthur.C.Guyton, John E Hall (2000), <i>Textbook of Medical Physiology</i> , W.B. Saunders Company, 10 th edition, pp. 1-1064.
E BOOKS	
1.	https://cleowilson.com/download-medical-books-human-anatomy-9th-edition-pdf/
MOOC	
1.	https://www.coursera.org › ... › Health › Basic Science
2.	https://oli.cmu.edu › courses › anatomy-physiology-i-ii...

COURSE TITLE	BIO- SENSORS AND SIGNAL PROCESSING							CREDITS	3			
COURSE CODE	ECM4377	COURSE CATEGORY			Minors	L-T-P-S	3-0-0-0					
VERSION	1.0	Approval details				LEARNING LEVEL	BTL-3					
ASSESSMENT SCHEME												
First Periodical Assessment	Second Periodical Assessment	Seminar/ Assignments/ Project			Surprise Test / Quiz	Attendance	ESE					
15%	15%	10%			5%	5%	50%					
Course Description	<p>The course introduces mathematical concepts of Signal Processing in time domain and frequency domain. The course covers the basic types of digital signals & systems through mathematical description and block-diagram system approach. It describes the different types of biosensors applied to different biomedical fields and measurement of various parameters, Biosensing Technology and its applications.</p>											
Course Objective	<ol style="list-style-type: none"> 1. To understand the DFT and its computation 2. To design and analyse the FIR filters 3. To Analyze and design IIR digital filters. 4. To Identify and analyse the bio-signals. 5. To Understand special techniques like Heart rate variability Analysis 											
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Compute DFT for biosignals 2. Design IIR digital filters using impulse invariance and bilinear transform 3. Design FIR digital filters using frequency sampling and window techniques 4. Analyse various bio signals 5. Summarize the special techniques like Heart rate variability Analysis 											
Prerequisites: SIGNAL PROCESSING												
CO, PO AND PSO MAPPING												
CO	PO 1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO 10	PO11	PO-12

CO-1	3	2	2	1	-	-	-	-	-	1	-	1
CO-2	3	2	3	2	2	-	-	-	-	-	-	1
CO-3	3	2	2	1	2	1	-	-	-	-	-	1
CO-4	-	-	1	-	1	2	-	-	-	1	-	1
CO-5	1	1	1	1	1	1	-	-	-	1	-	1

1: Weakly related, 2: Moderately related and 3: Strongly related

MODULE 1: TIME SIGNALS AND SYSTEMS												(9)
<p>Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms.</p> <p>Practical Components: Generation of various Signals thereby to understand their characteristics</p>											<p>CO-1</p> <p>BTL-3</p>	
MODULE 2: INFINITE IMPULSE RESPONSE DIGITAL FILTER												(9)
<p>Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.</p> <p>Practical Components: Design of digital IIR filter for the given specifications based on Impulse Invariant and Bilinear Transformation method</p>											<p>CO-2</p> <p>BTL-3</p>	
MODULE 3: FINITE IMPULSE RESPONSE DIGITAL FILTERS												(9)
<p>Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.</p> <p>Practical Components: Design of various FIR filter for the given specifications as per the application</p>											<p>CO-3</p> <p>BTL-3</p>	
MODULE 4: ANALYSIS OF BIO –SIGNALS												(9)
<p>Removal of artifacts-ECG ,Event detection –ECG,P wave, QRS Complex, T wave, correlation analysis of ECG signals ,Averaging of signals-PCG,ECG and EMG.</p> <p>Practical Components: Generation of ECG and EMG Signals</p>											<p>CO-4</p> <p>BTL-3</p>	

MODULE 5: SPECIAL TOPICS IN BSP		(9)
Heart rate variability Analysis .Analysis of PCG signals, Analysis of Time variant systems, Fixed segmentation –STFT, ACF, SEM and GLR. Practical Components: Generation of STFT for ECG Signals		CO-5 BTL-3
TEXT BOOKS		
1.	John G. Proakis and Dimitris G.Manolakis, (2007), <i>Digital Signal Processing, Algorithms and Applications</i> , PHI of India Ltd., New Delhi, 3rd Edition, pp. 1-1084.	
2.	Sanjit K.Mitra (2010), <i>Digital Signal Processing, A Computer Based Approach</i> , Tata McGraw-Hill, New Delhi, 4 th edition, pp. 1- 992.	
E BOOKS		
1.	https://www.academia.edu/28449859/J_G_Proakis_D_G_Manolakis_Digital_signal_processing_Principles_algorithms_and_applications_pdf	
MOOC		
1.	https://uttyler.instructure.com/courses/22295	

COURSE TITLE	BIOMEDICAL NANOTECHNOLOGY							CREDITS	3			
COURSE CODE	ECM4461		COURSE CATEGORY			Minors		L-T-P-S	2-1-0-0			
Version	1.0		Approval Details					LEARNING LEVEL	BTL-3			
ASSESSMENT SCHEME												
First Periodical Assessment	Second Periodical Assessment		Seminar/ Assignments/ Project			Surprise Test / Quiz		Attendance	ESE			
15%	15%		10%			5%		5%	50%			
Course Description	This course describes the application of Nanotechnology in Biomedical domain.											
Course Objective	<ol style="list-style-type: none"> 1. To familiarize about Nanomaterials 2. To get a deep insight about Nanotechnology 3. To learn about the various applications of nanomaterials in treatment. 4. To familiarize with Nanotechnology, Nanopharmacology, nanomaterials and Nanotoxicology 5. To summarize the various application in bionanotechnology 											
Course Outcome	<p>Upon completion of this course, the students will be able to</p> <ol style="list-style-type: none"> 1. Summarize about the nanomaterials. 2. Familiarize with the different nanotechnologies. 3. Elucidate the applications of nanomaterials and nanotechnology. 4. Interpret the need for nanotechnology in present day patient care. 5. Describe the applications of nanobiotechnology in various health domains 											
Prerequisites: NIL												
CO, PO AND PSO MAPPING												
CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	-	1	-	-	1	-	-	-	1	-	2
CO-2	3	-	1	-	3	1	1	-	-	2	-	2
CO-3	3	2	1	-	-	1	-	-	-	-	-	2
CO-4	3	-	1	-	2	1	2	-	-	-	-	2
CO-5	3	-	1	-	3	1	2	-	-	1	1	2
1: Weakly related, 2: Moderately related and 3: Strongly related												
MODULE 1: INTRODUCTION TO NANOMATERIALS											(9)	

Introduction to nano, Nano-biomimicry, Synthesis of nanomaterials by physical and chemical methods, Synthesis of nanomaterials by biological methods, Characterization of nanomaterials	CO-1 BTL-3
MODULE 2: INTRODUCTION TO NANOTECHNOLOGY AND CARBON NANOTUBES (9)	
DNA nanotechnology, Protein & glycol nanotechnology, Lipid nanotechnology, Bio-nanomachines, Carbon nanotube and its bio-applications	CO-2 BTL-3
MODULE 3: NANOTECHNOLOGY IN DIAGNOSIS (9)	
Nanomaterials for cancer diagnosis, Nanomaterials for cancer therapy, Nanotechnology in tissue engineering, Nano artificial cells, Nanotechnology in organ printing.	CO-3 BTL-3
MODULE 4: NANOMATERIALS (9)	
Nanotechnology in point-of-care diagnostics, Nanopharmacology & drug targeting, Cellular uptake mechanisms of nanomaterials, In vitro methods to study antibacterial and anticancer properties of nanomaterials, Nanotoxicology	CO-4 BTL-3
MODULE 5: BIONANOTECHNOLOGY (9)	
Development of nanobiotechnology - timelines and progress, overview - Biosensors ; different classes - molecular recognition elements, transducing elements. - Applications of molecular recognition elements in nanosensing of different analytes - Application of various transducing elements as part of nanobiosensors. - Miniaturized devices in nanobiotechnology	CO-5 BTL-3
TEXT BOOKS	
1.	Malsch N.H., (2005), <i>Biomedical Nanotechnology</i> , CRC Press. Pp. 1 -209
REFERENCE BOOKS	
1.	Mirkin, C.A. and Niemeyer, C.M., (2007), <i>Nanobiotechnology II: More Concepts and Applications</i> , Wiley-VCH. 2 nd edition.
2.	Kumar, C. S. S. R., Hormes, J. and Leuschner C., <i>Nanofabrication Towards Biomedical Applications: Techniques, Tools, Applications, and Impact</i> , WILEY -VCH Verlag GmbH & Co. pp. 1-460.
3.	Lamprecht, A., (2009) <i>Nanotherapeutics: Drug Delivery Concepts in Nanoscience</i> , Pan Stanford Publishing Pte. Ltd. Pp.1 -293.
MOOC	
1.	https://nptel.ac.in/courses/102/107/102107058/