SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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Board of Studies 2021-2022 (ODD SEM)

Minutes of Meeting

Date: 3rd July 2021   Time: 11 am

Chair-person   :   Dr.Aruni Wilson

Attendees   :   Dr. Chirayu Padhiar, External Member

                                   Senior Medical Director, LifeCell International Pvt., Chennai.

                                   Dr. Parthiban.M., External Member

                                   Professor and Head, Department of Animal Biotechnology,

                                   Madras Veterinary college, Chennai 600007

                                   Dr. Elizabeth Rani, External Member

                                   Head of the Department,Department of Biotechnology,

                                   Hindustan College of Arts and Science,Chennai

                                   Dr. Ramesh kumar V, Internal member

                                   Dr. Valli Nachiyar C, Internal member

                                   Dr. Jayshree Nellore, Internal member

The Chair-person welcomed the members.

Agenda of the meeting; Syllabus revisions and implementation in 2021- 2022

Following which discussions were held as follows,

B.Tech Biotechnology

Agenda Item 1:

The syllabus for the course SAIC4001 Industry 4.0 was revised to SCCA9504 INDUSTRY 4.0 FOR BIO ENGINEERS (PROJECT BASED LEARNING APPROACH) under Regulations 2019 and the same was tabled before the board for approval.

Resolutions: The BoS sanctioned the proposal to revise the course syllabus and approved the same (Annexure 1)

Agenda Item 2: To consider and approve the starting of new course under CBCS from the academic year 2021-2022

The Head of the department explained the salient features contained in the syllabus for the new course Medical Genomics

Resolutions: The BOS members reviewed and has recommended the same for approval. The approved syllabus is in the annexure I

M.Tech Biotechnology

Agenda Item 3:

The syllabus for the course SCCA9501Industry 4.0 was revised to SCCA9501 INDUSTRY 4.0 FOR BIO ENGINEERS (PROJECT BASED LEARNING APPROACH) under Regulations 2019 and the same was tabled before the board for approval.

Resolutions: The BoS sanctioned the proposal to revise the course syllabus and approved the same (Annexure 1)

Based on the suggestions given by the members, BoS resolved to recommend the minutes to the Academic Council for further approval.

Members	Signature
Dr. Chirayu Padhiar	
Dr. Elizabeth Rani	
Dr.Aruni Wilson	
Dr. Ramesh kumar V	
Dr.Valli Nachiyar	
Dr. Jayshree Nellore	

ANNEXURE-1

SCCA9504	**INDUSTRY 4.0 FOR BIO ENGINEERS** **PROJECT BASED LEARNING APPROACH**	**L**	**T**	**P**	**C**	**Max. Marks**
		1	**0**	**2**	**2**	**100**

COURSE OBJECTIVE:

- To demonstrate the achievement of efficient and economically viable production without being hazardous to human health and environment. Learners will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.

UNIT 1: MODELLING AND SIMULATION   **6 Hours**

Introduction to Industry 4.0 - The Various Industrial Revolutions - Modeling Principles: Introduction, definition of modeling and simulation, different types of models, application of mathematical modeling.

Simulation: Introduction, Simulation Tools, Process Simulation Software Platforms and Applications, Trends in Process Simulation Engineering

UNIT 2: SMART INDUSTRY   **6 Hours**

Road to Industry 4.0 - Green manufacturing, Robotic Automation, Industrial Applications- Manufacturing, Control, Maintenance and Assembly, RFID- Type, RFID system, applications, RFID in health care, Embedded Systems - Embedded firmware, Platform software design, Wireless design, Embedded testing, modeling & amp; automation, Hardware platform design, Device Management, Monitoring – Industrial monitoring, condition monitoring, Health monitoring. Sensor Technology and its applications, AI in smart manufacturing, Smart Factory logistics

UNIT 3 BIG DATA ANALYTICS AS SERVICE PROVIDER   **7 Hours**

Technologies for enabling Industry 4.0 - Role of data, information, knowledge and collaboration in future organizations. Big Data - Background - Programming- Python and R - Git - Docker - Pipelines - DNA and RNA Sequencing - Massively parallel sequencing - Applications - Next Generation Sequencing and its future and big data analytics in healthcare - Big Data Repositories - Cloud platforms and computing for automation - Embedded systems in healthcare - Digitization the future of healthcare - medical cyber-physical systems - Case study - Integration of Multi-Omics Big Data in Cardiovascular Risks and Diseases.

UNIT4 TISSUE ENGINEERING   **6 Hours**

Introduction, Methods, Materials, Material characterization; Scaffolds: Natural and Artificial polymers, Hydrogels, Bioceramics, Scaffold fabrication, Self-assembly, 3D Bioprinting: Introduction, Workflow, Imaging, 3D modeling, CAD-based design, Bioink, Techniques; Bioreactors for Tissue Engineering: Effect of different Parameters, Conditions; Tissue engineering for Skin, Bone, Vasculature and Cornea, Synthesis of different Nanostructures, Characterization of Nanostructures, Nanostructures in Diagnosis and Therapy, Organ printing. Scaffold techniques and the efficiency of gene-editing tools and their ability to fill the existing gaps in stem cell and regenerative therapies. Regulatory framework in development and marketing tissue-based products

UNIT 5 PROTOTYPING – TESTING AND COMMUNICATION   **20 Hours**

Applications and Case Studies - New ideas – centered design process – functional prototype - testing methods/ideas – prototyping and testbeds – proof of concept – assembly – prototyping apps – addressing the complex problems.

Max.45 Hours

COURSE OUTCOMES:

CO1.   Articulate on the new age technologies in the modeling of biochemical engineering.
CO2.   Integrate different emerging technologies to evolve Smart Factories
CO3.   Deduce the components that lead to industrial digital revolution
CO4.   Ability to assess the developments in bioengineering.
CO5.   Criticize the professional and ethical issues in novel industrial technologies.
CO6.   Develop a prototype/ innovative ideas in the various fields of biochemical engineering.

TEXT / REFERENCE BOOKS

1. Diego Galar Pascual, Pasquale Daponte, Uday Kumar, Handbook of Industry 4.0 and SMART Systems, 1st Editio, CRC Press, 2020

2. Sider W.D., Seader J. D., and Lewin D.R., Product and Process Design principles, Synthesis, Analysis and Evaluation, 2nd Edition, John Wiley and Sons, 2010.

3. Thomas Varghese & K.M. Balakrishna, Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, Atlantic, 2012

4. Uthayan Elangovan, Smart Automation to Smart Manufacturing: Industrial Internet of Things, Momentum Pr, 1st Edition, 2019.

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END SEMESTER EXAMINATION PATTERN

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Max Marks: 100

PROJECT PRESENTATION

SBTA4003	MEDICAL GENOMICS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

The course has been designed to show how genomics will be used for patient care with genetic disorders, and the knowledge and skills required to treat them.

UNIT 1   Genetic disorders and therapy   9 Hrs.

Single gene disorders and Multifactorial disorders - conventional and contemporary methods: Pedigree analysis, Linkage mapping, Positional/structural and functional cloning; Bioinformatic analysis; Genetic polymorphism and disease susceptibility. Treatment of genetic disorders: Methods of therapy - Drug (recombinant proteins); Gene (Viral vectors, delivery methods, efficacy); Some examples (Thalassemia, Phenylketonuria, Cystic fibrosis).

UNIT II   Diagnostic genetics   9 Hrs.

Cytogenetics/ Molecular methods; Screening for mutation/ chromosomal anomaly - Adult/Prenatal/New-born screening; Preimplantation screening (Assisted reproductive technology- in vitro fertilization and Embryo transfer); Forensic testing - DNA fingerprinting, paternity testing, individual identification. Genetic counselling: Prenatal/adult diagnosis of genetic disorders; Risks and benefits; Informed consent; Right of choice; Case studies.

UNIT III Functional genomics and animal models in human disease   9 Hrs.

cDNA/gene cloning; site-directed mutagenesis; mammalian tissue culture; cell line transfections; functional assays; Use of model organisms, methods for generation of transgenic animals/ knock-in, knockout models (microinjection, ES cell transformation); ENumutagenesis; RNAi approach.

UNIT IV CRISPR-Based Genome Engineering   9 Hrs.

Origins of CRISPR; CRISPR Knockout Basics (Experimental Design, Guide RNA design, Delivery into Cells, Genotyping, Validation); CRISPR Knockin (Inserting or Mutating DNA Sequences in the Genome); CRISPR Editing in Animal Models (Knockout and Knockin Strategies in Mice); CRISPR Screens (High throughput applications of CRISPR); CRISPR-Based Gene Therapy; The Future of CRISPR and Ethical Considerations (CRIPSR in the Clinic, CRISPR Babies, Case-Studies)

UNIT V Pharmacogenetics   9 Hrs.

Genetic drug response profiles, the effect of drugs on Gene expression.Concept of individualized drug therapy, Drivers and the promise of personalized medicine, Strategies for application of pharmacogenomics to customize therapy, Barriers.

Max.45 Hrs.

COURSE OUTCOMES
On completion of the course, student will be able to
 CO 1- Evaluate the genetic basis of disease
 CO 2-Choose a genetic test that is appropriate for a given clinical scenario
 CO 3- Assess the evolution of genomic technologies
 CO 4-Appraise the applications CRISPR technology for research, gene-therapy and the discovery of novel therapeutics
 CO 4-Criticise ethical problems pertaining to the use of transgenic models in biomedical research
 CO 5-Distinguish the effect of genetic differences between individuals in the outcome of drug therapy and in drug efficacy and toxicity.

TEXT BOOKS/REFERENCE BOOKS

1. Klug WS, Cummings MR, Spencer CA, Palladino MA, Killian D. Concepts of genetics. 2019.
2. Kisak PF, editor. CRISPR Technology:" the Revolutionary Breakthrough for Genetics & Evolution". 2017.
3. Church GM. Genome editing and engineering: from TALENs, ZFNs and CRISPRs to Molecular surgery. Cambridge University Press; 2018
4. Nussbaum RL, McInnes RR, Willard HF. Thompson & Thompson Genetics in Medicine Elsevier Health Sciences; 2015
5. Martin M. Zdanowicz, M.M. "Concepts in Pharmacogenomics" Second Edition, American Society of Health-System Pharmacists, 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100   **Exam Duration: 3 Hrs.**
PART A: 10 Questions of 2 marks each - No choice   **20 Marks**
PART B: 2 Questions from each unit of internal choice; each carrying 16 marks   **80 Marks**