SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES- VIRTUAL MEETING HELD ON 26TH JUNE 2020.

The following members were present in the meeting:

1. Dr. Wilson Aruni – Pro Vice Chancellor – Chair Person
2. Dr.Vignesh Muthu Vijayan – Associate Professor – IIT Madras – External member
3. Dr.K.Sathish Kumar – Associate Professor – SSN college of Engineering – External member
4. Dr.S.Sathish – Associate Professor – Head of the Department
5. Dr.D.Prabu – Associate Professor – Internal member
6. Dr.D.Joshua Amarnath – Professor – Internal member
7. Dr.A. Annam Renita – Professor – Internal member
8. Dr. S.S.Dawn – Professor – Head (Centre for Waste Management) – Internal member
9. Dr.J.Aravind Kumar – Asst. Professor – Internal member
10. Mr.D.Venkatesan – Asst. Professor – Internal member

At the outset, the Chair Person welcomed the members of BoS and placed the agenda for the deliberations of the members. The following deliberations were made as per the items of the circulated agenda.

1. Agenda item # 1 Modifications proposed for 2020 batch 'Bachelor of Technology – Chemical Engineering' students in SCHA1102 – Material Sciences.

   Head of the Department informed that the department teams have been working on the modification of curricula and in this direction the following changes were proposed to be made on SCHA1102.

   - Incorporation of the following topics in Unit IV- Characterization of biomaterials, Properties of implants, Degradation of materials in the biological environment

   Resolutions: The External members considered the revision made and discussed different issues. Dr. K. Sathish Kumar pointed that the incorporated topics was not repeated in Industry 4.0. And it was confirmed that the topics are not repeated.Then the members approved the modification in curricula for consideration for the matter regarding the implementation of scheme from academic year 2020-21 batch onwards.

1. Agenda item # 2 Addition of two new open elective Courses for B.Tech Programme – Chemical Engineering

   The Head of the department highlighted the feedback from the Alumni for the incorporation of elective courses focusing on emerging technologies and the feedback

from Mr.Raghuram, SIM INFOSYSTEMS, to focus on computational methods and simulation. Based on the feedback, Department proposed the following courses for the incorporation in professional electives.

Course 1: Green Technology – *Annexure 1*
Course 2 :Smart materials for Industries– *Annexure 2*
Course 3: Computational Fluid Dynamics– *Annexure 3*
Course 4: Industry 4.0 – *Annexure 4*
Course 5: Computational methods in Chemical engineering – *Annexure 5*

Resolutions:

The BOS resolved to recommend for approval of the suggestedcourses for inclusion in B.Tech Programme of Chemical Engineering.Dr.Vignesh Muthu Vijayan highlighted the importance of Industry 4.0 and Computational Fluid Dynamics and suggested to incorporate in core subjects and rest of the courses in Professional elective.

2. Agenda item # 3 Revision of Syllabus

   Resolutions: The BoS resolved to approve the proposal of the department of merging Fluid Mechanics and Mechanical operations Lab as “Unit Operation Lab”

3. Skill Development in professional domains and branch specific areas to promote industry ready competency among learners. Necessary certification courses to improve the modern tool usage.

   Head pointed the workshop and value-added course offered by the department such as Process simulation, Biorefinery and Fire safety.

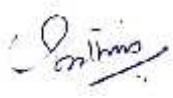
   Resolutions: The BoS recommended that simulation courses like ASPEN, HYSYS should also promote the industry ready competency among the students.

4. Any other points with the permission of Chair Person -Academic flexibilities with extra credits acquired through either advanced study of same courses or with procuring additional credits from additional courses as per student’s choice was suggested. Universal Human values was introduced as a mandate course

   Head asked the suggestion to the External members for students undergoing specialization.

   Resolutions: The BoS recommended that advanced courses/NPTEL courses/ simulation courses like ASPEN, HYSYS can be selected for the specialization. They also suggested that the students can opt these courses at the end of the fourth semester subject to the condition prescribed by the Senate time to time.

With the above discussion, the Head expressed his deep sense of gratitude to all members for an academic vibrant discussion on various matters. Since there was no other agenda,the meeting ended with the Vote of thanks to the Chair Person.



Internal Member	Designation	Signature
Dr.S.Sathish	HoD	
Dr.D.Joshua Amarnath	Professor	
Dr.A. Annam Renita	Professor	
Dr. S.S.Dawn	Professor	
Dr.D.Prabu	Associate Professor	
Dr.J.AravindKumar	Asst. Professor	
Mr.D.Venkatesan	Asst. Professor	

PRO VICE CHANCELLOR/CHAIR

12/3/21, 12:33 PM Sathyabama Institute of Science and Technology (Deemed to be University) Mail - MINUTES OF THE BOS MEETING HEL...

Sathyabama Institute of Science & Technology WEBMAIL

Hod Chemical <chemicalhod@sathyabama.ac.in>

MINUTES OF THE BOS MEETING HELD ON 26/06/20

5 messages

Hod Chemical <chemicalhod@sathyabama.ac.in> Sun, Jun 28, 2020 at 10:44 PM
To: vigneshm@iitm.ac.in
Bcc: sathishkumark@ssn.edu.in

Respected Sir,
Please find the attachment of BoS minutes of meeting held on 26//06/20 for your information . In this regard I request you to check it once before we take it in to academic council.

thanks and regards
HOD

BoS- MOM- Department of Chemical Engineering.docx
16K

Vignesh MuthuVijayan <vigneshm@iitm.ac.in> Mon, Jun 29, 2020 at 12:28 AM
To: Hod Chemical <chemicalhod@sathyabama.ac.in>

It looks fine. Please go ahead.

Vignesh

Annexure 1

New Course	GREEN TECHNOLOGY	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE:

- To demonstrate the achievement of efficient and economically viable chemical production without being hazardous to human health and environment

UNIT 1: INRODUCTION **9 Hours**

Fundamentals of Green Technology, need, goal and limitations of Green technology, sustainable development, twelve principles of Green technology.

UNIT 2: GREEN CHEMISTRY **9 Hours**

Green chemistry metrics (atom economy, atom efficiency, E-factor),Green synthesis like photochemical ,microwave, sonochemistry and electrochemistry, green reagents, green catalysts , solvent free reactions, toxicity reactions.

UNIT 3 GREEN PROCESSES

9Hours Renewable energy technologies like solar, wind, hydropower, geothermal and biomass energy, phytoremediation, eco-restoration, issues and challenges.

UNIT4 GREENER NANOSYNTHESIS AND GREEN NANOMATERIALS **9 Hours**

Greener Synthetic methods for metal and semiconductor and inorganic oxide, functionalized metal nanoparticles. Green materials, -biomaterials, biopolymers, bioplastics, composites, Sensors, Biomimetic Sensors, Smart nanomaterials.

UNIT 5 GREEN NANOMATERIALS FOR ALTERNATIVE ENERGY/REMEDIATION **9 Hours**

Nanomaterials for fuel cells and hydrogen generation and storage. Nanostructures for efficient solar hydrogen production, solar thermal Energy and Photovoltaic. Nanomaterials -Remediation: Nano membranes, Nanofibers, Nano Adsorbents, Nano Catalysts, Nano-sensors.

Max.45 Hours

COURSE OUTCOMES:

CO1. Understand the principles of green chemistry and technology
CO2. Outline to Concepts of Greener Nano synthesis and
CO3. Apply the Green Nanomaterials to show relevance to green chemistry and technology
CO4. To familiarize with the synthesis of nanomaterials
CO5. To understand the application of green nanomaterials for alternative energy
CO6. Identification, design and evaluation of remediation issues using green nanomaterials

TEXT / REFERENCE BOOKS

1. Mike Lancaster, Green Chemistry: An introductory Text, RSC Publishing V. K. Ahluwalia, Green Chemistry: Environmentally Benign Reactions, Ane Books India, New Delhi, 2006.
2. Jay Warmke, Annie Warmke, Green Technology, Educational Technologies Group, 2009.
3. David. T, Allen and David R. Shonnard, "Green engineering" Prentice Hall NJ, 2002
4. James clark, "Green chemistry" Blackwell publishing, 2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100 Examination duration: 3 Hours
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

Annexure 2

New Course	SMART MATERIALS FOR INDUSTRIES	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE:

- To acquire basic understanding of advanced materials, their functions and properties for technological applications and emphasize the significance of materials selection in the design process

Unit I INTRODUCTION TO SMART MATERIALS **9 HOURS**

Smart materials and structures- System intelligence- components and classification of smart structures, common smart materials and associated stimulus-response, Application areas of smart systems Ferroelectric materials: Piezoelectric materials- piezoelectric effect, Direct and converse, parameter definitions, Piezoceramics, Piezopolymers, Piezoelectric materials as sensors, Actuators and bimorphs

Unit II SHAPE MEMORY ALLOYS **9 HOURS**

Shape memory alloys (SMAs), Shape memory effect, Martensitic transformation, One way and two-way SME, training of SMAs, binary and ternary alloy systems, Functional properties of SMAs. Characterization tests for smart materials: Principles, instrumentation and applications of: Ion beam techniques- Surface mass spectrometry, LEIS, ISS; Mass spectrometry.

Unit III CHROMIC MATERIALS **9 HOURS**

Thermochromism, Photochromism, Electrochromism, Halochromism,Solvatochromism- principle and design strategies and applications in industries. Introduction to synchrotron radiation and its applications in materials science; Vibrational spectroscopy of surfaces based on colour change.

Unit IV POLYMERIC MATERIALS **9 HOURS**

Thermally responsive polymers, Electroactive polymers microgels, Synthesis, Properties and Applications, Protein-based smart polymers, pH-responsive and photo-responsive polymers, Self-assembly, Molecular imprinting using smart polymers, Approaches to molecular imprinting, Drug delivery using smart polymers

Unit V SENSORS AND SMART HYDROGELS **9 HOURS**

Elastic memory composites, Smart corrosion protection coatings, Self-healing materials, Sensors, Actuators, Transducers, MEMS, Deployment devices, Molecular machines, Smart hydrogels- synthesis, properties and application in industries.

COURSE OUTCOMES:

CO1. Describe the basic features of smart materials.
CO2. Illustrate the characteristics of shape memory alloys
CO3. Obtain a knowledge on chromic materials
CO4. An understanding of knowledge about Polymeric materials
CO5. Demonstrate the usage of sensors and smart hydrogels
CO6. Students will familiarize with various materials in industries.

TEXT / REFERENCE BOOKS

1. D.J. Leo, Engineering Analysis of Smart Material Systems, Wiley 2007.
2. M. Addington, D.L. Schodek, Smart Materials and New Technologies in Architecture, Elsevier 2005.
3. M. Schwartz, New Materials, Processes, and Methods Technology, CRC Press, 2006.
4. Galaev, B. Mattiasson (Eds.), Smart Polymers: Applications in Biotechnology and Biomedicine, 2nd ed., CRC Press, 2008.
5. N. Yui, R. J. Mrsny, K. Park (Eds.), Reflexive Polymers and Hydrogels: Understanding and Designing Fast Responsive Polymeric Systems, CRC Press, 2004.

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END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100 Examination duration: 3 Hours
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

Annexure 3

New Course	COMPUTATIONAL FLUID DYNAMICS	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE: To understand the flow, temperature field in engineering problems and diffusion in mass transfer operations. Students can develop a Computational Fluid Dynamics code to solve chemical engineering problems

UNIT 1: OVERVIEW OF CFD AND CONSERVATION LAWS **9 hours**

Role of CFD, Problem solving in CFD, Components of CFD Software,Governing Equations of Fluid flow and Heat Transfer, Mass conservation, Momentum and Energy equation, Differential and Integral forms, Conservation and non-conservation form.

UNIT 2: TURBULENCE AND ITS MODELLING **9 hours** Transition from Laminar to Turbulent flow, Effect of turbulence on time-averaged Navier-Stokes equations, Characteristics of simple turbulent flows, Free turbulent flows, Flat plate boundary layer and pipe flow, Turbulence models, Mixing length model, Reynolds stress equation models.

UNIT 3: FINITE VOLUME METHOD **9 hours**

Introduction, One dimensional steady state diffusion, Two-dimensional diffusion problems, Discretised equations for diffusion problems, One-dimensional unsteady state heat conduction, Discretisation of transient convection-diffusion equation, Solution procedures for unsteady flow calculations, Implementation of Inlet, outlet and wall boundary conditions, Constant pressure boundary condition.

UNIT 4: CFD METHODS **9 hours**

CFD Methods for the Eular Equation- Linearization and Jacobian Matrix ,Eigen values and Eigenvectors, Flux Splitting Methods**.** CFD Methods For Navier-Stokes Equations-Beam Warming Algorithm, Mac Cormack's scheme, Upwind Techniques.

UNIT 5: GRID GENERATION **9 hours** Structured Grid generation, Unstructured Grid generation, Adaptive Grid generation, Physical aspects, simple and multiple connected regions, grid generation by PDE solution.

Max.45 hours

Course Outcomes:

CO1 Understand the basic concept of CFD and conservation laws in chemical engineering.
CO2 Ability to develop model for a given fluid flow system.
CO3 Experiment with finite volume techniques for fluid flow and heat transfer models.
CO4 Analyze finite difference method for mass transfer problems.
CO5 Evaluate computational fluid flow problems using finite volume techniques.
CO6 Solve and Get familiarized to develop grid generation and analysis of complex fluid-flow systems.

TEXT / REFERENCE BOOKS:

1. Anderson, J. D.,Computational Fluid Dynamics: The Basics with Applications, 2nd Edition,McGraw Hill International Editions,2012..
2. Fletcher, C. A. J., Computational Techniques for Fluid Dynamics,3rd Edition Springer Verlag, 2001.
3. Versteeg, H.K. and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The Finite Volume Method, 2ndEdition ,Pearson Education Ltd., 2007.
4. Chung T. J., Computational Fluid Dynamics,2nd Edition, 2nd Edition Cambridge University Press,2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100 Examination duration: 3 Hours
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

Annexure 4

New Course	INDUSTRY 4.0	L	T	P	C	Max. Marks
		2	0	2	2	100

UNIT 1 ADVANCED TECHNOLOGY AND ADVANCED MATERIALS **7 Hrs.**

Advanced electro-optical sensing technology-active, passive multi-spectral and hyper spectral imaging; electronic beam steering; vacuum technology, surface and coating technology, health care technology, Nanotechnology- Nano mechanics, Nano optoelectronics; energy storage technology-next generation Li-based Batteries, Hydrogen storage, solar photovoltaics', Flexible electronics. Intellectual Property Rights - case studies governing/pertaining to Materials/Technology.

UNIT 2 TRANSFORMING TECHNOLOGIES IN BIOENGINEERING **7 Hrs.**

Establishment of smart biotechnology factory, Artificial intelligence in Bioprocess technology, Omics – Big data analysis through automation, 3D bio printing for tissue engineering. Simulation tools, RSM and Box model. Cyber physical system based telemedicine, diagnosis and therapeutics through real time biosensors. Bio nanotechnology. Intellectual Property rights (IPR): Case Studies**.**

UNIT 3 ADVANCEMENTS IN SUSTAINABLE BUILT ENVIRONMENT **7 Hrs.**

Introduction – Technological developments in Architectural, Engineering and Construction (AEC) - Building Information Modelling (BIM) using Cloud computing technology and Internet of things (IoT) – Unmanned Aerial Vehicles, sensors – Additive manufacturing in construction – Concrete 3D printing - Materials used - Lightweight and functionally graded structures - Net Zero Energy buildings, Bioswales, Biofiltration pond, Ecosan systems- Recent developments in Waste water Management, Air pollution control, waste disposal - Integration of energy, water and environmental systems for a sustainable development- Emerging Technologies: Robot Highway- Vertical farming - Intellectual Property rights: Case studies

UNIT 4 SMART MANUFACTURING **8 Hrs.**

Smart factories and interconnection, Smart Manufacturing – automation systems, Additive Manufacturing, Smart grids, Micro Electro Mechanical Systems (MEMS), Stealth technology, Metal Finishing, Self-propelled vehicles, e mobility, green fuels, drones – unmanned aerial vehicles (UAVs), aerodynamics. Robotic Automation and Collaborative Robots – Augmented reality and haptics, engineering cybernetics and artificial intelligence (AI), Disruptive Technologies – Frugal Innovations – Emerging Technologies - Autonomous Robots, Swam Robot, Modular Robotics, Space craft, Intellectual Property Rights (IPR): Case Studies.

UNIT 5 SMART WORLD **8 Hrs.**

Smart Sensors and IIOT, Smart grid, Hybrid renewable energy systems, Electronics in Smart city, Integration of Sensors in Robots and Artificial Intelligence, 5G Technology, Communication protocols, Human-Machine Interaction, Virtual Reality, Quantum Computing: Changing trends in transistor technology: Processor, Emerging Trends: Deep Space, Swarm Robots, Cyborg, Geofencing, Pervasive Computing, Intellectual Property Rights- Case Studies.

UNIT 6 CYBER PHYSICAL SYSTEMS **8 Hrs.**

Introduction to Cyber Physical Systems (CPS), Architecture of CPS, Data science and technology for CPS, Prototypes of CPS, Emerging applications in CPS including social space, crowd sourcing, healthcare and human computer interactions, Industrial Artificial Intelligence, Deep Learning, Gamification, Networking systems for CPS applications, Wearable cyber physical systems and applications, Domain applications of CPS: Agriculture, Infrastructure, Disaster management, Energy, Transportation, Intellectual Property Rights (IPR) : Case Studies.

COURSE OUTCOMES:

CO1. Apply the basic concepts for electro optical sensing technology and selection of materials.
CO2. Analyze the technology on AI and Big Data for biomedical applications.
CO3. Elaborate the various technologies for sustainable built environment.
CO4. Evaluate different smart manufacturing technologies for industrial robotics-based automation.

CO5. Compare various advanced technologies for development of smart city.
CO6. Build Cyber physical systems using AI for Industry, Agriculture and disaster management applications.

Max. 45 Hrs.

TEXT / REFERENCE BOOKS

1. William D. Callister, Materials Science and Engineering: An Introduction, John Willey and Sons Inc. Singapore, 2001.
2. Raghavan V., Physical Metallurgy: Principle and Practice, Prentice Hall India Pvt. Ltd., 2006.
3. Flavio Craveiro, Jose Pinto Duarte, Helena Bartolo and Paulo Jorge Bartolo, “Additive manufacturing as an enabling technology for digital construction: A perspective on Construction 4.0”, Automation in Construction, Vol. 103, 2019.
3. Klaus Schwab, Fourth Industrial Revolution, Random House USA Inc., New York, USA, 2017.
4. Oliver Grunow, ”SMART FACTORY AND INDUSTRY 4.0. The current state of Application Technologies”, Studylab Publications, 2016.
5. Alasdair Gilchrist, “INDUSTRY 4.0: Industrial Internet of Things”, Apress, 2016.
6. Sang C.Suh, U.JohnTanik, John N Carbone, Abdullah Eroglu, “Applied Cyber-Physical Systems”, Springer Publications, New York, 2013

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	Exam Duration: 3 Hrs.
PART A: 11 Questions of 2 marks each-No choice	22 Marks
PART B: 2 Questions from each unit with internal choice, each carrying 13 marks	78 Mark

Annexure 5

New Course	COMPUTATIONAL METHODS IN CHEMICAL ENGINEERING	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE:

- To impart computational techniques for chemical engineering calculations

UNIT 1: BASICS OF MATLAB **9 Hours**

Starting MATLAB,Help, Simple, Functions, Output, Algebra Vectors, Graphs, Interrupting, Syntax, Suppressing Output,Defining Matrices, Size of Matrix, The Identity Matrix, Specialized Matrices ,Diagonal Matrices, The ,Manipulating Matrices, Matrices, matrix Multiplication, String Arrays, Printing Output,MATLAB Scripting Language: M-File MATLAB Search Path, Path Management, and Startup ,File, Function, Errors.

UNIT 2: FORMULATION OF PHYSICAL PROBLEMS **9 Hours**

Mathematical statement of the problem, Representation of problems, Formulation on extraction in single & multiple stages, Radial heat transfer through a cylindrical conductor, salt accumulation in stirred tank.

UNIT 3: INITIAL VALUE PROBLEMS **9 Hours**

Initial value problems for ordinary differential equations- Trapeziodal method, Runge Kuttamethods , interpolation, Extrapolation and Gaussian quadrature.

UNIT 4: NUMERICAL OPTIMIZATION AND PARAMETER ESTIMATION TECHNIQUES **9 Hours**

Methods for constrained and unconstrained optimization- Lagrangian methods, Simplex, Newton line search method, , least square regression,. Applications- Fitting a kinetic rate law to time dependent data.

UNIT 5: BOUNDARY VALUE PROBLEMS **9 Hours**

Introduction to boundary value problems, finite difference method, finite volume method, finite element method. Applications of BVP-Chemical reaction and diffusion in a spherical catalyst, finite differences for a convection, diffusion equation.

Max.45 Hours

Course Outcomes:

CO1: Understand the basic concepts of Matlab
CO2: Outline to Formulate physical problems
CO3: Solve Initial value problems
CO4: Examine numerical optimization
CO5: Evaluate parameter estimation techniques
CO6: Estimate boundary value problems

TEXT / REFERENCE BOOKS:

1 Beers K.J., Numerical Methods for Chemical Engineering: Appplications in MATLAB, 1st Edition, Cambridge University Press ,2007.

2.Jain M.K., Iyengar S.R.K., Jain R.K.,Numerical methods: Problems and solutions, 4th Edition, New age international publishers, 2003.

3 Davis. M.E.,Numerical Methods and Modeling for Chemical Engineers, 1st Edition, John Wiley &Sons, 1984.

4. LoneyN.W.,Applied mathematical models for chemical Engineers, 2nd Edition, CRC press, 2006.

5.Mickley, Reid and Sherwood, Applied Mathematics in Chemical Engineering, 2nd Edition, Tata-McGraw-Hill, New Delhi,1978

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100	Examination duration: 3 Hours
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 Mark