



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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Minutes of board of studies meeting of Department of Chemical Engineering,

Sathyabama Institute of Science and Technology, held on

3rd Jan 2022

A meeting of board of studies of Department of Chemical Engineering was held in virtual mode at 11:00 AM on 3rd Jan 2022. The meeting was attended by

1. Dr.S.Sathish – Head/ Associate Professor /Chemical
2. Dr.D.Prabu –Associate Professor/ Chemical
3. Dr.K.Sathishkumar – Expert member/ Associate Professor – SSN college of Engineering
4. Dr.A.Annam Renita- Professor/Chemical – Internal Member
5. Dr.J.Aravindkumar – Assistant Professor / Chemical – Internal Member
6. Dr.D.Venkatesan - Assistant Professor / Chemical – Internal Member
7. Dr.Sanjeet Kumar Singh - Assistant Professor / Chemical

The Board of studies discussed the Agenda and decided as under:

- **Item no 1:** In order to maintain the employability skill a new open elective course on Industry 4.0 for bio and Chemical Engineers is introduced. The course with the title Industry 4.0 was introduced for 2019 batch which covers the area from all the discipline. Now the course is modified with the recent technology pertain to Chemical and Bio disciplines.
- **Item no. 2** Seeking approval for the modification in Industry 4.0 for bio and chemical engineers as a Project Based learning Approach for UG - B.Tech - CHEM/BME/BTE as a 2 credit course. The course is assessed in the way of 50% theory and 50% practical course. Internal marks from CAE 1 and CAE 2 and assignments. Instead of ESE theory exam, the students will be assessed based on the case study (design, implementation, operation) presentation.

The external member approved the course content and appreciates the modifications. All the members unanimously recommended the changes. The Chairman approved the decisions. The meeting ended with Thank you note.

(S/A)

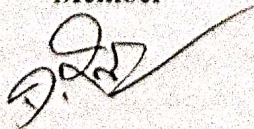
Expert member

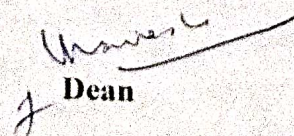
Member

Member



Head 03/JAN/2022




Dean

SCHA 4005 SAIC4004	INDUSTRY 4.0 FOR BIO & CHEMICAL 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 & automation, Hardware platform design, Device Management, Monitoring – Industrial monitoring, condition monitoring, Health monitoring.

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 PLANT/PROCESS MANAGEMENT**6 Hours**

Business issues in Industry 4.0 - Nanobiotechnology: Synthesis of different Nanostructures, Characterization of Nanostructures, Nanostructures in Diagnosis and Therapy. Tissue Engineering: Scaffolds: Natural and Artificial polymers, Scaffold fabrication, 3D Bioprinting; Bioreactors for Tissue Engineering: Effect of different Parameters, Conditions; Tissue engineering for Skin, Bone, Vasculature and Cornea; 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 test beds – proof of concept – assembly – prototyping apps – addressing the complex problems.

COURSE OUTCOMES:**Max.45 Hours**

- 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.

Signature
03/01/22

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.

Max Marks: 100

END SEMESTER EXAMINATION PATTERN

PROJECT PRESENTATION

Signature
03/01/2022

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES 06TH JAN 2021 THROUGH ONLINE MODE.

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 *Aravind*

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. The minutes of BoS meeting was held on 26th June 2020, were reviewed and approved by the members. The comments were placed in 16th Academic Council and the same was approved.
2. Agenda item # 1 Planning of new one credit course under R2019
Head of the Department proposed the new proposal for the introduction of new one credit course on CDIO approach in project design and project management.

Recommendations: The External members considered the proposal. Dr.Sathish informed that the department teams have been working on the modification under the team of Dr.D.Prabu and Dr.A.Annam Renita.

3. Agenda item # 2 Highlighting the CBCS courses offered during 2020-21 odd semester for B.Tech - Programme– Chemical Engineering
 - The Head of the department highlighted the courses taken by the students during July 2020 – Dec 2020. Based on the feedback from the experts/Alumni the interdisciplinary courses were given as a Choice based Credit courses. Students opted the various interdisciplinary courses such as Entrepreneurship Essentials (SBAA1603), Network Security (SCS1316), Machine Learning (SIT1305), Industrial Robotics and Expert Systems (SMEX3012), Disaster

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Management(SCIA4001), Stress Management (SPSY1604), Alternative Fuels and Energy Systems (SME1603), Hospital Management (SBMA3009).

- Also, the Head highlighted that the students from other disciplines opted the courses offered by Chemical Engineering such as Environmental Impact Assessment (SCHA4003), Industrial Safety and Hazard Analysis (SCHA3010).

Recommendations:The BOS gave their consent and were satisfied with the action taken on the feedback and also suggested the department to motivate students to focus on new emerging technologies such as Industrial Automation, Artificial Intelligence/ Data sciences and Simulation.

4. Agenda item # 3 Implementation of Industry 4.0 and Computational Fluid Dynamics

As the new courses which was proposed in the previous BoS meeting, Industry 4.0 (SAIC4001) and Computational Fluid Dynamics (SCHA1403) was planned to implement in the 4th Semester for 2019 batch (Jan 2021 – May 2021) and rest of the courses were planned to be incorporated in the professional electives.

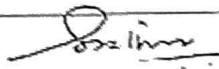
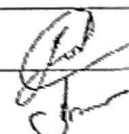
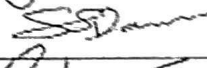
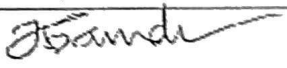
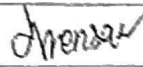
Resolutions: Approved as recommended.

5. Skill Development in professional domains and branch specific areas to promote industry ready competency among learners.

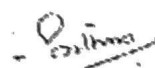
Head pointed the skill development course conducted in association with Rubber Skill Development Council.

Resolutions:The BoS recommended the initiation taken by the department.

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.

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



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.

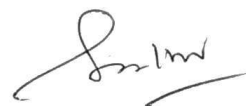
- Incorporation of the following topics in Unit IV- Characterization of biomaterials, Properties of implants, Degradation of materials in the biological environment

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

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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 suggested courses 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.

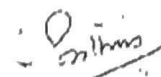
Resolutions: The BoS recommended that simulation courses like ASPEN, HYSYS should also promote the industry ready competency among the students.

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.

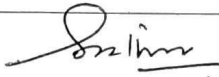
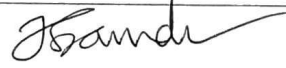


- ✕. Agenda item # 3 Skilling in professional domains and branch specific areas to promote industry ready competency among learners. Necessary certification courses to improve the modern tool usage.

Head pointed the workshop and certification course offered by the department such as Process simulation and Fire safety.

The BoS recommended that simulation courses like ASPEN, HYSYS should also promote the industry ready competency among the students. Also advanced courses/NPTEL courses/simulation courses recommend that the students can opt these courses at the end of the fourth semester.

The meeting ended with the Vote of thanks to the Chair.

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

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

3 messages

Hod Chemical <chemicalhod@sathyabama.ac.in>
To: vigneshm@iitm.ac.in

Bcc: sathishkumark@ssn.edu.in

Sun, Jun 28, 2020 at 10:44 PM

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>

To: Hod Chemical <chemicalhod@sathyabama.ac.in>

Mon, Jun 29, 2020 at 12:28 AM

It looks fine. Please go ahead.

Vignesh

Get Outlook for Android

From: Hod Chemical <chemicalhod@sathyabama.ac.in>

Sent: Sunday, June 28, 2020 10:44:55 PM

To: vigneshm@iitm.ac.in <vigneshm@iitm.ac.in>

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

[Quoted text hidden]

Hod Chemical <chemicalhod@sathyabama.ac.in>

To: Sathish S <sathish.chemical@sathyabama.ac.in>

Mon, Jun 29, 2020 at 7:29 AM

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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: INTRODUCTION**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.

UNIT 4 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

Part A: 10 questions of 2 marks each - No choice

Part B: 2 questions from each unit of internal choice; each carrying 16 marks

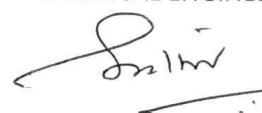
Examination duration: 3 Hours

20 Marks

80 Marks



CHEMICAL ENGINEERING



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.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100

Part A: 10 questions of 2 marks each - No choice

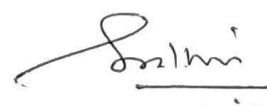
Part B: 2 questions from each unit of internal choice; each carrying 16 marks

Examination duration: 3 Hours

20 Marks

80 Marks

CHEMICAL ENGINEERING

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 Euler 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.

Course Outcomes:**Max.45 hours**

- 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, 2nd Edition, 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

Part A: 10 questions of 2 marks each - No choice

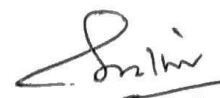
Part B: 2 questions from each unit of internal choice; each carrying 16 marks

Examination duration: 3 Hours

20 Marks

80 Marks

CHEMICAL ENGINEERING

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- Trapezoidal method, Runge Kutta methods, 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: Applications 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. Loney N.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

CHEMICAL ENGINEERING

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.

CHEMICAL ENGINEERING





SATHYABAMA

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Minutes of special meeting of board of studies of Department of Chemical Engineering, Sathyabama Institute of Science and Technology, held on
17th OCT 2019

A special meeting of board of studies of Department of Chemical Engineering was held in Admin block Conference room at 11:00 AM on 17th Oct 2019. The meeting was attended by

1. Dr. Wilson Aruni – Pro Vice Chancellor/Chairman
2. Dr. D. Prabu – Head/ Associate Professor/ Chemical
3. Dr. S. Sathish – Head/ Associate Professor /Chemical
4. Dr. K. Sathishkumar – Expert member/ Associate Professor – SSN college of Engineering
5. Dr. D. Joshua Amarnath – Professor/Chemical
6. Dr. A. Annam Renita- Professor/Chemical

The Board of studies discussed the Agenda and decided as under:

- Item no 1: In order to balance the credit load in all the semesters it was decided to shift one course from second semester SCHA1202 – Chemical Engineering Thermodynamics – I to third semester.
- Item no 2: Shifting the SCHA1302 - Chemical Engineering Thermodynamics – II from third semester to fourth semester.
- Item no 3: The respective same subject codes will be maintained for all practical purposes/as their syllabi and mark structures were remain same.

All the members unanimously recommended the changes.

The Chairman approved the decisions. The meeting ended with Thank you note.

K. Sathish

Expert member

[Signature]

Member

[Signature]

Member

[Signature]

Head

[Signature]

Head

[Signature]

Chairman/Pro- Vice Chancellor

HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai,
Chennai - 600 119

Dr. A. WILSON ARUNI, Ph.D., FAMPV.
PRO-VICE CHANCELLOR
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai,
Chennai - 600 119.

**PROGRAMME: B.Tech
CHEMICAL ENGINEERING
CURRICULUM**

SEMESTER-1										
Sl. No.	COURSE TYPE	COURSE CODE	COURSE TITLE	L	T	P	C	Marks		PAGE No.
								CAE	ESE	
1	Theory	SMTA1101	Engineering Mathematics-I	3	*	0	3	50	50	
2	Theory	SCHA1101	Principles of Chemical Engineering	3	*	0	3	50	50	
3	Theory	SCHA1102	Material Sciences	3	0	0	3	50	50	
4	Theory	SCSA1102	Fundamentals of Python Programming	3	*	0	3	50	50	
5	Theory	SCYA1101	Engineering Chemistry	3	1	0	4	50	50	
6	Practical	SCYA2101	Chemistry Laboratory	0	0	4	1	25	25	
7	Practical	SCSA2102	Fundamentals of Python Programming Lab	0	0	4	2	50	50	
8	Practical	SCHA2103	Technical Analysis and Instrumentation Lab	0	0	4	2	50	50	
9	Theory	SSTA1101	Environmental Science and Engineering	2	0	0	0	0	0	
Total Credits for 1 st semester = 21										
Total Marks for 1 st semester = 750										

SEMESTER-2										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMTA1201	Engineering Mathematics III	3	0	0	3	50	50	
2	Theory	SPHA1101	Physics for Engineers	3	1	0	4	50	50	
3	Theory	SCHA1201	Mechanical Operations	3	0	0	3	50	50	
4	Theory	SEEA1101	Basic Electrical and Electronics Engineering	3	0	0	3	50	50	
5	Theory	SMEA1102	Engineering Drawing	3	*	0	3	50	50	
6	Theory	SHSA1101	Technical English	3	0	0	3	50	50	
7	Practical	SMEA2201	Workshop Practice	0	0	4	2	50	50	
8	Practical	SPHY2101	Physics Laboratory	0	0	2	1	25	25	
Total Credits for 2 nd semester = 22										
Total Marks for 2 nd semester = 750										

L - LECTURE HOURS, T - TUTORIAL HOURS, P - PRACTICAL HOURS, C - CREDITS

CAE - CONTINUOUS ASSESSMENT EXAMINATION,

ESE - END SEMESTER EXAMINATION,

* - EXTRA TUTORIAL HOURS CAN BE TAKEN IF REQUIRED.

Revised

HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Street, Santhi Salai
Chennai - 600 113

B.Tech - Chemical Engineering

REGULATIONS-2019

SEMESTER-3										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMTA1301	Engineering Mathematics – III	3	0	0	3	50	50	
2	Theory	SCHA1301	Heat Transfer	3	*	0	3	50	50	
3	Theory	SCHA1202	Chemical Engineering Thermodynamics - I	3	*	0	3	50	50	
4	Theory	SCHA1303	Fluid Mechanics	3	0	0	3	50	50	
5	Theory	SCHA1304	Chemical Process Calculations	3	*	0	3	50	50	
6	Theory	SCHA1305	Chemical Process Technology	3	0	0	3	50	50	
7	Practical	SCHA2306	Organic Chemical Process and Thermodynamics Lab	0	0	4	2	50	50	
8	Practical	SCHA2307	Unit Operations Lab	0	0	4	2	50	50	
Total Credits for 3 rd semester = 22										
Total Marks for 3 rd semester = 800										

SEMESTER- 4										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SMTA1401	Engineering Mathematics – IV	3	0	0	3	50	50	
2	Theory	SCHA1401	Mass Transfer – I	3	0	0	3	50	50	
3	Theory	SCHA1402	Chemical Reaction Engineering – I	3	*	0	3	50	50	
4	Theory	SAIC4001	Industry 4.0	3	0	0	2	50	50	
5	Theory	SCHA1403	Computational Fluid Dynamics	3	*	0	3	50	50	
6	Theory	SCHA1302	Chemical Engineering Thermodynamics – II	3	*	0	3	50	50	
7	Practical	SCHA2404	Heat Transfer Lab	0	0	4	2	50	50	
8	Practical	SCHA2405	Mass Transfer Lab	0	0	4	2	50	50	
Total Credits for 4 th semester = 21										
Total Marks for 4 th semester = 800										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
 CAE – CONTINUOUS ASSESSMENT EXAMINATION, ESE – END SEMESTER EXAMINATION,
 VIVA – VIVAVOCE

**- EXTRA TUTORIAL HOURS CAN BE TAKEN IF REQUIRED*

REVISED

SEMESTER- 5										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCHA1501	Mass Transfer - II	3	*	0	3	50	50	
2	Theory	SCHA1502	Process Engineering Economics	3	0	0	3	50	50	
3	Theory	SCHA1503	Instrumentation and Process Control	3	*	0	3	50	50	
4	Theory	SCHA1504	Chemical Reaction Engineering - II	3	*	0	3	50	50	
5	Theory		Professional Elective - 1	3	0	0	3	50	50	
6	Theory		Open Elective - 1	3	0	0	3	50	50	
7	Practical	SCHA2505	Chemical Reaction Engineering Lab	0	0	4	2	50	50	
8	Practical	SCHA2506	MAT Lab	0	0	4	2	50	50	
9	Practical	S19APT1	Professional Training	0	0	4	2		100	
Total Credits for 5 th semester = 24										
Total Marks for 5 th semester = 900										

SEMESTER- 6										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCHA1601	Biochemical Engineering	3	0	0	3	50	50	
2	Theory	SCHA1602	Transport Phenomena	3	*	0	3	50	50	
3	Theory		Professional Elective - 2	3	0	0	3	50	50	
4	Theory		Professional Elective - 3	3	0	0	3	50	50	
5	Theory		Open Elective - 2	3	0	0	3	50	50	
6	Practical	SCHA2603	Process Dynamics and Control Lab	0	0	4	2	50	50	
7	Practical	SCHA2604	Process Equipment Design and Drawing Lab	0	0	4	2	50	50	
8	Practical	S19APT2	Interdisciplinary project	0	0	6	3		100	
Total Credits for 6 th semester = 22										
Total Marks for 6 th semester = 800										

L - LECTURE HOURS, T - TUTORIAL HOURS, P - PRACTICAL HOURS, C - CREDITS
 CAE - CONTINUOUS ASSESSMENT EXAMINATION, ESE - END SEMESTER EXAMINATION,
 VIVA - VIVAVOCE

*- EXTRA TUTORIAL HOURS CAN BE TAKEN IF REQUIRED

REVISED


 HEAD OF THE DEPARTMENT
 DEPARTMENT OF CHEMICAL ENGINEERING
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SEMESTER-7										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCHA1701	Process modeling and Simulation	3	0	0	3	50	50	
2	Theory	SCHA1702	Process Engineering	3	0	0	3	50	50	
3	Theory		Professional Elective – 4	3	0	0	3	50	50	
4	Theory		Open Elective – 3	3	0	0	3	50	50	
5	Practical	SCHA2703	Process Simulation Lab	0	0	4	2	50	50	
6	Practical	S19APROJ1	Project Phase I	0	0	6	3		100	
Total Credits for 7 th semester = 17										
Total Marks for 7 th semester = 600										

SEMESTER-8										
Sl. No.	Course type	Course code	Course title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SBAA4001	Principles of Management	3	0	0	3	50	50	
2	Theory		Open Elective 4	3	0	0	3	50	50	
3	Practical	S19APROJ2	Project Phase II	0	0	14	7		100	
Total Credits for 8 th semester = 13										
Total Marks for 8 th semester = 300										

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
 CAE – CONTINUOUS ASSESSMENT EXAMINATION, ESE – END SEMESTER EXAMINATION,
 VIVA – VIVAVOCE

REVISED

HEAD OF THE DEPARTMENT
 DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
 INSTITUTE OF SCIENCE AND TECHNOLOGY
 (DEPARTMENT OF UNIVERSITY)
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 Chennai - 600 119

Semester	Theory courses (including elective courses)			Practical Courses (including PT and project)		
	Total no.	Total Credits	Total Marks	Total no.	Total Credits	Total Marks
1	6	16	500	3	5	250
2	6	19	600	2	3	150
3	6	18	600	2	4	200
4	6	17	600	2	4	200
5	6	18	600	3	6	300
6	5	15	500	3	7	300
7	4	12	400	2	5	200
8	2	6	200	1	7	100
Overall Total	41	121	4000	18	41	1700

Overall total credits for B.Tech Chemical	162
Overall total marks for B.Tech Chemical	5700

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
 CAE – CONTINUOUS ASSESSMENT EXAMINATION, ESE – END SEMESTER EXAMINATION,
 VIVA – VIVAVOCE

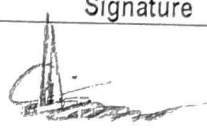
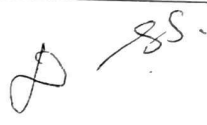
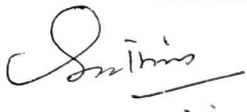
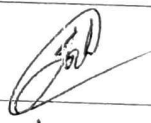
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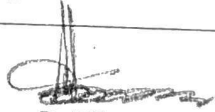
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SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIO AND CHEMICAL ENGINEERING DEPARTMENT OF CHEMICAL ENGINEERING BOARD OF STUDIES-2019

The following are the board of studies members for the department of Chemical Engineering.

S.No	Name and Designation	Member Status	Signature
1.	Dr.Wilson Aruni Pro-Vice Chancellor, Sathyabama Institute of Science and Technology	Chairman	
2.	Dr.Vignesh Muthu Vijayan Professor, Department of Chemical Engineering, IIT Madras, Chennai.	Member	
3.	Dr. K. Sathish Kumar Associate Professor, Department of chemical Engineering, SSN College of Engineering, Chennai	Member	
4.	Dr.S.S.Dawn, Professor, Centre of waste Management, Sathyabama Institute of Science and Technology	Member	
5.	Dr.Prabu.D, HOD i/c, Associate Professor, Department of chemical Engineering, SIST	Member	
6.	Dr.S.Sathish, HOD i/c, Associate Professor, Department of Chemical Engineering, SIST	Member	
7.	Dr.D.Joshua Amarnath, Professor, Department of Chemical Engineering, SIST	Member	
8.	Dr.A.Annam Renita, Professor, Department of Chemical Engineering, SIST	Member	


Dr.Wilson Aruni

Pro-Vice Chancellor,
Sathyabama Institute of Science and Technology

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIO AND CHEMICAL ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

BOARD OF STUDIES-2019

The following are the board of studies members for the department of Chemical Engineering.

S.No	Name and Designation	Member Status	Signature
1.	Dr.Wilson Aruni Pro-Vice Chancellor, Sathyabama Institute of Science and Technology	Chairman	
2.	Dr.Vignesh Muthuvijayan Associate Professor, Department of Biotechnology, IIT Madras, Chennai.		M. Vignesh
3.	Dr. K. Sathish Kumar Associate Professor, Department of chemical Engineering, SSN College of Engineering, Chennai		G. Sathish Kumar
4.	Dr.S.S.Dawn, Professor & Head, Centre of waste Management, Sathyabama Institute of Science and Technology, Chennai-119		D. S. Dawn
5.	Dr.Prabu.D, HOD i/c, Associate Professor, Department of chemical Engineering, SIST		P. Prabu D.
6.	Dr.S.Sathish, HOD i/c, Associate Professor, Department of Chemical Engineering, SIST		S. Sathish
7.	Dr.D.Joshua Amarnath, Professor, Department of Chemical Engineering, SIST		D. Joshua Amarnath
8.	Dr.A.Annam Renitta, Professor, Department of Chemical Engineering, SIST		A. Annam Renitta

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

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2.	Dr.Vignesh Muthu Vijayan Associate Professor, Department of Biotechnology, IIT Madras, Chennai.	Member	M. Vignesh
3.	Dr. K. Sathish Kumar Associate Professor, Department of Chemical Engineering, SSN College of Engineering, Chennai	Member	K. Sathish Kumar
4.	Dr.S.S.Dawn, Professor & Head, Centre of waste Management, Sathyabama Institute of Science and Technology	Member	D. S S
5.	Dr.Prabu.D, HOD I/c, Associate Professor, Department of Chemical Engineering, SIST	Member	D. Prabu
6.	Dr.S.Sathish, HOD I/c, Associate Professor, Department of Chemical Engineering, SIST	Member	S. Sathish
7.	Dr.D.Joshua Amarnath, Professor, Department of Chemical Engineering, SIST	Member	D. Joshua
8.	Dr.A.Annam Renita, Professor, Department of Chemical Engineering, SIST	Member	A. Annam Renita

Dr.Wilson Aruni

Pro-Vice Chancellor,
Sathyabama Institute of Science and Technology



Dr. Vignesh Muthuvijayan
Associate Professor

Department of Biotechnology
Bhupat and Jyoti Mehta School of Biosciences
Indian Institute of Technology Madras
Chennai 600036, India
Phone : +91-44-2257 4123
Email : vigneshm@iitm.ac.in

April 2, 2019

To,
The Pro Vice-Chancellor,
Sathyabama Institute of Science and Technology,
Chennai 600119

Dear Sir,

Sub: Board of Studies meeting on April 3, 2019

I have gone through the revised syllabi for the ME Environmental Engineering and BTech Chemical Engineering. I don't have any comments or concerns regarding the curriculum for ME Environmental Engineering. This ME curriculum is acceptable in its present form.

Concerning the BTech Chemical Engineering curriculum, I strongly feel that offering Biochemical Engineering in the second semester is too early. The syllabus of this course requires students to have some understanding of Chemical Process Calculations, Mass Transfer, Fluid Mechanics, etc., which are all being taught at a later stage. Either this course, in its current form, needs to be moved to sixth or a higher semester or the content of this course needs to be modified in a way that basic topics in biology are taught. I request the Board of Studies to discuss and resolve this issue.

I wish you all success in teaching these courses.

With regards,

M. Vignesh



Dr. Vignesh Muthuvijayan
Associate Professor
Department of Biotechnology
Indian Institute of Technology Madras
Chennai 600 036, India

From
Dr.K.Sathish Kumar, Ph.D.,
Associate Professor
Department of Chemical Engineering
SSN College of Engineering
Chennai

To
Chairman, Board of Studies
& Pro-Vice Chancellor
Sathyabama Institute of Science
Chennnai-600119

Dated:03.04.2019

Sir,

Sub: B.Tech and M.E. Syllabi – School of Bio and Chemical Engineering – Department of Chemical Engineering – Reg.

Further to your request to evaluate and review the B.Tech and M.E. Syllabi, I wish to inform that I have gone through the syllabi of the following courses (as given below) and necessary modifications were suggested and carried out.

Courses:

B.Tech – Chemical Engineering
M.E – Environmental Engineering

Thank you,


(K.Sathish Kumar)

From
Dr.K.Sathish Kumar, Ph.D.,
Associate Professor
Department of Chemical Engineering
SSN College of Engineering
Chennai

To
Chairman, Board of Studies
& Pro-Vice Chancellor
Sathyabama Institute of Science
Chennnai-600119

Dated:03.04.2019

Sir,

Sub: B.Tech and M.E. Syllabi – School of Bio and Chemical Engineering – Department of Chemical Engineering – Reg.

Further to your request to evaluate and review the B.Tech and M.E. Syllabi, I wish to inform that I have gone through the syllabi of the following courses (as given below) and necessary modifications were suggested and carried out.

Courses:

B.Tech – Chemical Engineering

M.E – Environmental Engineering

Thank you,


(K.Sathish Kumar)

To

The Pro Vice-Chancellor,

Sathyabama Institute of Science and Technology,

Chennai-600119

Dear Sir,

I have gone through the revised syllabi for the B.Tech Chemical Engineering and P.G Environmental Engineering and all the suggestions pointed out have been carried out from your end.

I wish you all success in the conduct of the courses.

A handwritten signature in black ink, consisting of a stylized 'A' followed by 'SS'.

Dawn, S.S,

Professor & head

Centre of waste management,

Sathyabama Institute of Science and Technology



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
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SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES 3rd Apr. 2019.

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute of Science and Technology

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

Chairperson welcomed the members to give their valuable suggestions for enhancing the syllabus. The minutes of BoS meeting was held on 3rd April 2019, were reviewed and approved by the members. The comments were placed in 15th Academic Council and the same was approved.

1. Agenda item # 1 Wide scope of open electives provided

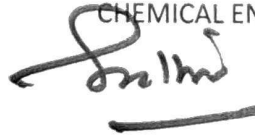
Head of the Department proposed inclusion of many open electives in order to facilitate students from entire institute to have interdisciplinary knowledge and proposed a total of 25 open electives

Recommendations: The External members thoroughly discussed the syllabus of open electives and resolved to approve the same.

2. Agenda item # 2 Reduction of Credits as per AICTE norms

The Head of the department highlighted the notification from AICTE that credits of the curriculum have to be reduced from 162 from next academic year

- **Recommendations:** The BOS members suggested to include one value added course in the curriculum while reduction of credits and to adjust the total credits to be adjusted across the semesters.

CHEMICAL ENGINEERING




SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

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3. Agenda item # 3 Introduction of new course Principles of Chemical Engineering

Principles of Chemical Engineering encompassing the core aspects of chemical engineering was proposed for Department of Chemical Engineering and Biotechnology

Resolutions: Approved as recommended.

4. Agenda item # 4 Introduction of Python -theory and Lab

To improve the skill part the new course introduced in the odd semester 2019-20 Python, new software was proposed in the first semester as theory and practical course.

Resolutions: The BoS approved the introduction of the new course.

Meeting ended with a vote of thanks by the Chair Person.


HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai
Chennai - 600 119

From

01.04.2019

The Head of the department

Department of Chemical Engineering,

School of Bio & Chemical Engineering,

Sathyabama Institute of Science and Technology,

Chennai-119

To

The Vice-Chancellor,

Sathyabama Institute of Science and Technology,

Chennai-119

Respected Sir,

As per the discussions with the subject experts of the Institution and in accordance with the norms of AICTE, the Department of Chemical Engineering has revised the academic curriculum (2019-2020) of Undergraduate course of B.Tech (Chemical Engineering).

The Salient features of the Revision are:

1. Industrial version 4.0 is introduced.
2. Total Credits have been reduced from 190-163 credits
3. Principles of Chemical Engineering, Workshop and CFD have been introduced to meet the requirements of the today's competent world.
4. Entire curriculum has been revised as per the rising demand of various industrial technologies.

Sl.no.	Name of the Internal member	Signature
1.	Dr.Joshua Amarnath	
2.	Dr.Annam Renitta	
3.	Dr.S.S.Dawn	
4.	Dr.D.Prabu HOD(i/c)	
5.	Dr.S.Sathish HOD (i/c)	
6.	Mr.Senthil Kumar	
7.	Mr.D.Venkadesan	
8.	Mr.J.Aravind Kumar	

HOD/Chemical Engineering

HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai,
Chennai - 600 119

Forwarded

Pro Vice Chancellor

Dr. A. WILSON ARUNI, Ph.D., FAMPV.
PRO-VICE CHANCELLOR
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai,
Chennai - 600 119.

New Course	PRINCIPLES OF CHEMICAL ENGINEERING	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE:

- To introduce and provide an overview of chemical engineering.
- To enable the students to learn about the fluid flow, heat transfer and mass transfer in engineering applications.

UNIT 1: CHEMISTRY, CHEMICAL ENGINEERING AND CHEMICAL TECHNOLOGY**9 Hours**

Chemical process industries: History and their role in Society; Role of Chemical Engineer; History and Personalities of Chemical Engineering; Greatest achievements of Chemical Engineering, Challenges in Petroleum sector.

UNIT 2: COMPONENTS OF CHEMICAL ENGINEERING**9 Hours**

Role of importance of Basic sciences in chemical engineering. Batch Processing, Safety issues in Scale up to Commercial scale. Dimensionless Analysis: Dimensionless numbers. Application of Dimensional Analysis to a Reactor.

UNIT 3: CONCEPT OF UNIT PROCESSES AND UNIT OPERATIONS**9 Hours**

Description of different Unit Processes and Unit Operations; Designing of equipment; Flowsheet representation of process plants, Evolution of an Industry – Sulphuric acid and Soda ash manufacture. Demonstration of simple chemical engineering experiments; Plant visit to a chemical industry

UNIT 4: ROLE OF COMPUTER IN CHEMICAL ENGINEERING**9 Hours**

Chemical Engineering Software; Visit to Process Simulation Lab; Relation between Chemical Engineering and other engineering disciplines; Traditional vs. modern Chemical Engineering; Versatility of Chemical Engineering: Role of Chemical Engineers in the area of Food, Medical, Energy, Environmental, Biochemical, Electronics etc.

UNIT 5: SAFETY ENVIRONMENT AND ETHICS FOR CHEMICAL ENGINEERS**9 Hours**

Paradigm shifts in Chemical Engineering; Range of scales in Chemical Engineering; Opportunities for Chemical Engineers; Future of Chemical Engineering. Safety in Chemical Process Industries, Hazards – Case studies.

Max.45 Hours**COURSE OUTCOMES:**

- CO1. To make the student appreciate the purpose to create a new domain in which it is easier to handle the problem that is being investigated.
- CO2. Understanding the Concepts in chemical Engineering
- CO3. An ability to apply knowledge of mathematics, science, and engineering
- CO4. Students will attain knowledge in Unit operation and Process in Industries
- CO5. An understanding of professional and ethical responsibility
- CO6. Students will familiarize with softwares available for chemical engineering

TEXT / REFERENCE BOOKS

- Anantharaman N., MeeraSheriffa Begum K. M., Mass Transfer Theory and Practice, 1st Edition, PHI, 2011.
- Dryden, C.E., "Outlines of Chemicals Technology", Edited and Revised by Gopala Rao, M. and M.Sittig, 3rd Edition, Affiliated East-West press, 2000.
- McCabe, W.L., Smith, J. C. and Harriot, P. "Unit operations in Chemical Engineering", McGraw Hill, 7th Edition, 2001
- Finlayson, B. A., Introduction to Chemical Engineering Computing, John Wiley & Sons, New Jersey, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100

Part A: 10 questions of 2 marks each - No choice

Part B: 2 questions from each unit of internal choice; each carrying 16 marks

Examination duration: 3 Hours

20 Marks

80 Marks

B.Tech – Chemical Engineering

2019 Regulations

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES- HELD ON 21st May 2018.

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute
of Science and Technology

The following members were present in the meeting:

1. Dr. Anima Nanda – Chair Person
2. Dr. Mukesh Doble – Professor – IIT Madras – External member
3. Dr. A. Annam Renita – Professor – Head of the Department
4. Dr. S. Sathish – Associate Professor – Internal member
5. Dr. D. Prabu – Associate Professor – Internal member
6. Dr. D. Joshua Amarnath – Professor – Internal member
7. Dr. S. S. Dawn – Professor – Head (Centre for Waste Management) – Internal member
8. Dr. J. Aravind Kumar – Asst. Professor – Internal member
9. Mr. D. Venkatesan – Asst. Professor – Internal member

Chair Person welcomed the members and highlighted the importance of curriculum design and development to incorporate the technological changes, research requirements and employability needs

1. Agenda item # 1 Introduction of Course objectives and Course Outcomes

Head of the Department informed discussions on proposed inclusion of objectives and outcomes as part of B Tech regulation 2015 for odd semester courses (1, 3, 5 and 7) and approval of the same. The Department of Chemical Engineering of School of Bio and Chemical Engineering undertook a detailed exercise and based on the inputs from all course coordinators and batch coordinators, all the courses were reviewed once again. Though 2015 Regulation of B.Tech degree programme have course objectives for all courses, the course outcomes were not spelt out. He stated that the present exercise incorporates the elaborated objectives along with the outcome for all courses in conjunction with the course curriculum already spelt out through Units I, II, III, IV, V.

He further added that as per the direction of SIST, this exercise has been carried out for all the odd semester courses in semesters 1, 3, 5 and 7 are taken up now. Within six months next set of courses for even semester subjects will be taken up. Thereafter a detailed discussion

on each of the courses pertaining to the semesters 1, 3, 5 and 7 based on the draft revisions circulated and presented by all the Course coordinators.

Resolutions: The external members welcomed the inclusion of course objectives and outcomes since it will enable the students and stake holders to understand the subject outcomes and choose accordingly

2. Agenda item # 2 Change of SCH1402 Optimization of Chemical process from elective to core

HOD informed the BOS members that he along with staff felt strongly that optimization is the current trend in industrial processes and there is a need for making Optimization of Chemical process a core subject instead of elective

Resolutions:

Dr.Vignesh Muthu Vijayan expressed that he change can be beneficial since the students have to study if its offered as core and suggested for case studies to be included for relevant topics especially in Unit-5.

3. Agenda item # 3 Introduction of SCH4059 MATLAB

Due to incorporation of software tools in both industry and research MATLAB was proposed for inclusion in curriculum.

Resolutions:The BoS resolved to approve the proposal of the MATLAB in the sixth semester as practical course.

4. Agenda item # 4 Introduction of elective SCH1616 Environmental Impact Assessment

Environmental regulations are becoming more stringent due to rising pollution and Head of the Department felt the need for offering Environmental Impact Assessment to the students in eighth semester

Resolutions: BOS members had a thorough discussion and suggested to introduce the elective in seventh semester

The Chairperson thanked the BOS members for their contribution towards the conduct of this BOS meeting. He thanked him for his valuable suggestions on the agenda items presented.


HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Adityanagar, Rajiv Gandhi Salai
Chennai - 600 115



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

(Established under Section 3 of the UGC Act, 1956)

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Minutes of the BOS Meeting -2018 combined Board of Studies (UG and PG)
Meeting held on 21st May, 2018 at 9.00 am. Dean Office, School of Bio &
Chemical Engineering, Sathyabama Institute of Science and Technology,
Chennai.

Members Present

Name		Signature
Dr. Mukesh doble	Convener	
Dr. Anima Nanda	Member	
Dr. Valli Nachiyar	Member	
Dr. Jayshree Nellore	Member	
Dr. Karthick Raja Namasivayam	Member	
Dr. Masilamani Selvam M	Member	
Dr. Bavanilatha	Member	
Dr. Reji J V	Member	
Dr. Sudha	Member	
Dr. Usha Nandhini	Member	
Dr. Prabavathy D	Member	
Dr. Thyagarajan R	Member	
Dr. Prakash P	Member	
Ms. Utharalakshmi N	Member	
Ms. Subhashini D	Member	
Ms. Raji P	Member	
Mr. Narendrakumar G	Member	
Ms. Renugadevi R	Member	
Dr. Joshua amaranth	Member	
Dr. Annam renita	Member	
Dr. Prabu D	Member	
Mr. Senthil kumar P	Member	

Mr. Venkatesan	Member	<i>venkatesan</i>
Mr. Aravind kumar	Member	<i>Aravind</i>
Dr. Sathish	Member	<i>Sathish</i>
Ms. Sindu Divakaran	Member	<i>Sindu</i>
Ms. Bethanney J	Member	<i>Bethanney</i>
Mr. Umashankar	Member	<i>Umashankar</i>
Dr. Krishnakumar	Member	<i>Krishnakumar</i>
Dr. Premkumar	Member	<i>Premkumar</i>
Dr. Sudhakar	Member	<i>Sudhakar</i>
Dr. Jaynthy C	Member	<i>Jaynthy C</i>
Dr. Alex Anand D	Member	<i>Alex Anand D</i>
Dr. Jemmy Christy	Member	<i>Jemmy Christy</i>

Absent

Dr. V.Rameshkumar	Member
Dr. Swetha Sunkar	Member
Dr. Antony V. Samrot	Member

Dr. Mukesh Doble, Convener or chairman BOS Introductory comments and the first and third semester subjects for the undergraduate B.Tech and postgraduate M.Tech papers for the department were reviewed.

A total of 17 UG and 11 PG subjects were checked for the course content and the course outcomes.

After a brief introduction, the agenda items listed were taken up for discussion and the following resolutions were passed.


DR. MUKESH DOBLE
 HOD
 DEPARTMENT OF BIOTECHNOLOGY
 Anna Institute of Technology, Anna
 Chennai - 600 036, India.



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INSTITUTE OF SCIENCE AND TECHNOLOGY

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Minutes of the Board of Studies (R15/2) meeting

A Board of Studies meeting was held at the Department of Chemical Engineering on 21st May 2018 with the following agenda:

1. Welcome address and Opening remarks on Sathyabama Institute of Science and Technology's proposal to incorporate norms laid out by NAAC and NBA in curriculum.
2. Discussion on proposed inclusion of objectives and outcomes as part of B.Tech regulation 2015 for odd semester courses (1, 3, 5 and 7) and approval of the same.
3. Any other matter with the permission of Chair.

After that the BOS discussed and resolved the following items:

Agenda notes for (R15 / 2) / 1 - Welcome Address and Opening remarks on Sathyabama Institute of Science and Technology's proposal to incorporate norms laid out by NAAC and NBA in curriculum.

Dr. Anima Nanda welcomed the Board of Studies External member Dr. Dr. Mukesh Doble and thanked him for accepting the invitation of SIST at a very short notice. He informed the member about the purpose of this special Board of Studies meeting with particular reference to the SIST's proposal to go in for NBA and NAAC accreditation. He stated that the SIST has taken an initiative across all the Schools and a consultative process was initiated by the Vice Chancellor who briefed the faculty members on the need for this and the methodology to be adopted. The important point to be noted is that in regulation 2015, the course outcomes are not clearly spelt out though the course objectives are mentioned.

Agenda notes for (R15 / 2) / 2 - Discussions on proposed inclusion of objectives and outcomes as part of B Tech regulation 2015 for odd semester courses (1, 3, 5 and 7) and approval of the same.

Dr. Mukesh Doble informed that in tune with the SIST's requirement, the Department of Chemical Engineering of School of Bio and Chemical Engineering undertook a detailed exercise and based on the inputs from all course coordinators and batch coordinators, all the courses were reviewed once again. Though 2015 Regulation of B.Tech degree programme have course

objectives for all courses, the course outcomes were not spelt out. He stated that the present exercise incorporates the elaborated objectives along with the outcome for all courses in conjunction with the course curriculum already spelt out through Units I, II, III, IV, V.

He further added that as per the direction of SIST, this exercise has been carried out for all the odd semester courses in semesters 1, 3, 5 and 7 are taken up now. Within six months next set of courses for even semester subjects will be taken up.

Thereafter a detailed discussion on each of the courses pertaining to the semesters 1, 3, 5 and 7 based on the draft revisions circulated and presented by all the Course coordinators. A thorough scrutiny of the amendments proposed was made by the BOS External member and after a consultative process with the Dean and Course coordinators, the revisions to syllabus including the course objectives and course outcomes were approved. The final syllabus of courses in the semesters 1, 3, 5 and 7 incorporating the discussed changes is attached in **Annexure A**.

Agenda notes for (R15 / 2) / 3 - Any other matter

- i. The Dean Dr. Anima Nanda informed the expert member that the Department of Chemical engineering has completed 25 years successfully and invited suggestions on celebration of the same.
- ii. The expert member Dr. Mukesh Doble suggested to incorporate problematic paper and to introduce tutorial hours of those subjects.

Vote of Thanks

Dr. D. Prabu thanked the expert member Dr. Mukesh Doble for accepting the invitation of SIST in attending the BOS at a short notice. He thanked him for his valuable suggestions on the agenda items presented. He also thanked Dean Dr. Anima Nanda, Staff members for their contribution towards the conduct of this BOS meeting.

Sathyabama Institute of Science and Technology
B.Tech CHEMICAL ENGINEERING

Program Educational Objectives

1. To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.
2. To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.
5. To develop a working knowledge of chemical Engineering product and its processes

Program Outcomes

1. To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, simulation and mathematical modeling to the solution of complex engineering problems.
2. To analyze the problem by finding its domain and applying domain specific skills
3. To apply the knowledge of chemical engineering for development of projects, and its finance and management.
4. To undertake any responsibility as an individual and as team in a multidisciplinary environment.
5. To justify social, health, safety and legal issues and understand its responsibilities in chemical engineering practices.
6. To contribute towards the society by understanding the impact of Engineering on global aspect.
7. To understand environment issues and design a sustainable system.
8. To understand and follow professional ethics.
9. To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.
10. To demonstrate effective communication at various levels.
11. To apply the knowledge of Chemical Engineering for development of projects, and its finance and management.
12. To keep in touch with current technologies and inculcate the practice of lifelong learning.



Signature of BOS member



Internal member



External member

Sathyabama Institute of Science and Technology
B. Tech Chemical engineering
SCH1101: ENVIRONMENTAL SCIENCE AND ENGINEERING

Teaching Scheme:
 TH: 03 Hours/Week

Credit
 03

Examination Scheme:
 In-Sem (Paper): 50 Marks
 End-Sem (Paper): 50 Marks

Course Objectives:

1. To impart knowledge on the issues related to environment and to emphasize the importance of a clean environment

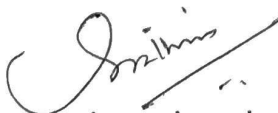
Course outcome

1. Understand the importance of the Environment.
2. Identify the Environmental impact due to human activities and disaster management.
3. Identification of prevention and control measures of various pollution
4. Identify the threats to biodiversity and the ways for Conservation of Biodiversity
5. Understand the water stress problems and energy crisis in present era.
6. Issues involved in enforcement of environmental legislation

Course Contents

Unit-I	Definition, scope and importance, need for public awareness, forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, floods, drought, conflicts over water, dams-benefits and problems, mineral resources: use effects on forests and tribal people. water resources: use and over-utilization of surface and ground water, exploitation, environmental effects of extracting and using mineral resources, case studies food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources: Case studies. Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification, role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.	10Hrs
Unit-II	Concept of an ecosystem, structure and function of an ecosystem - producers, consumers and decomposers - energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Introduction to biodiversity, definition: genetic, species and ecosystem diversity - biogeographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, biodiversity at global, national and local levels. India as a mega-diversity nation, hot-spots of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, endangered and endemic species of India, conservation of biodiversity, in-situ and ex-situ conservation of biodiversity.	10Hrs
Unit-III	Definition - causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, role of an individual in prevention of pollution, pollution case studies, disaster management: floods, earthquake, cyclone and landslides.	9Hrs


 Signature of BOS member


 Internal member


 External member

Unit-IV	From unsustainable to sustainable development, urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns, case studies, environmental ethics: issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Wasteland reclamation, consumerism and waste products - environment protection act: air (prevention and control of pollution) act - water (prevention and control of pollution) act, wildlife protection act; forest conservation act. Issues involved in enforcement of environmental legislation, Key initiatives of Rio declaration, Vienna convention, Kyoto protocol, Johannesburg summit and public awareness.	8Hrs
Unit-V	Population growth, variation among nations, population explosion, family welfare programme, environment and human health, human rights, value education, HIV / AIDS, women and child welfare, role of information technology in environment and human health, case studies. Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain. Visit to a local polluted site-urban/rural/ industrial/agricultural-study of common plants, insects, birds-study of simple ecosystems, pond, river, hill slopes etc.	8Hrs

Text / References:

1. Meenakshi. P, Elements of Environmental Science and Engineering, 1st Edition, Prentice Hall of India, New Delhi, 2009.
2. Ravikrishnan. A, Environmental Science & Engineering, 3rd Edition, Sri Krishna Publications, Chennai, 2008.
3. Wrigh. R. T & Nebel B.J, Environmental science-towards a sustainable future by Richard 8th edition, Prentice Hall of India, NewDelhi,2006
4. Erach Bharucha, Text Book of Environmental Studies, 2nd Edition, University Press, Chennai, 2006

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**
Signature of BOS member
Internal member
External member

Sathyabama Institute of Science and Technology

B. Tech Chemical engineering

SCH1205: ENERGY ENGINEERING

Teaching Scheme:

TH: 03 Hours/Week

Credit

03

Examination Scheme:

In-Sem (Paper): 50 Marks

End-Sem (Paper): 50 Marks

Course Objectives:

1. To impart in depth understanding of the issues related with renewable energy and their development

Course outcome

1. Understand various conventional and non- conventional energy sources.
2. Evaluate the advantages and disadvantages of various types of bio gas generators
3. Demonstrate the working principle of biomass gasifiers
4. Classify wind energy conversion systems
5. Compare the various methods of generating ocean thermal electric power
6. Demonstrate the working principle of various kinds of fuel cells.

Course Contents

Unit-I	Conventional energy sources; non-conventional energy sources; Energy sources, Coal, Oil, Natural gas, nuclear fuels, Hydro power advantages. Classification of fuels. Solar Energy, Solar radiation and its measurement, solar constant, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement. Introduction to solar energy. Applications, solar water heating, space heating, space cooling, solar thermal electric conversion. Agriculture and industrial process heating, solar distillation, solar pumping, solar cooking.	9Hrs
Unit-II	Biomass conversion Technologies. Wet processes, Dry processes. Biogas generation. Factors affecting biodigestion or generation of gas. Classification of biogas plants. Advantages and disadvantages of floating drum plant. Advantages and disadvantages of fixed dome type plant. Types of biogas plants (KVIC model & Janata model). Selection of site for biogas plant.	9 Hrs
Unit-III	Methods of obtaining energy from biomass, Thermal gasification of biomass, Classification of biomass gasifiers, Chemistry of gasification process, Applications of the gasifiers. Magneto hydrodynamic generator, electrical conductivity and formation of MHD, performance	9 Hrs
Unit-IV	Basic components of WECS (wind energy conversion system): Classification of WECS, Types of wind machines, horizontal axis machines, vertical axis machines. Applications of wind energy. Energy from the oceans: Introduction, Ocean thermal electric conversion (OTEC), Methods of ocean thermal electric power generation, Open cycle OTEC system, Closed or Anderson OTEC cycle, hybrid cycle. Application of energy from oceans.	9 Hrs
Unit-V	Fuel Cells, Difference between batteries and fuel cells, Components of fuel cells, Principle of working of fuel cells, Fuel cell types: Alkaline fuel cells. Polymer electrolyte fuel cells, Phosphoric acid fuel cells, Molten carbonate fuel cells, Solid oxide fuel cells, Types of solid acid fuel acid fuel cells, Applications. Co-generation- waste heat recovery and heat pump.	9 Hrs

Text / References:

1. Rai G.D., Solar Energy Utilisation, 3rd Edition, Khanna Publishers, New Delhi, 2000.
2. Rai G.D., Non Conventional Energy Sources, 3rd Edition, Khanna Publishers, New Delhi, 2000.
3. Rao S.S., Energy Technology, 3rd Edition, Khanna Publishers, New Delhi, 2006
4. Rused C.K., Elements of Energy Conservation, 4th Edition, McGraw Hill, 1985.
5. Christopher H. and Armsted H., Geothermal Energy, 2nd Edition, John Wiley, New York, 1978.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 questions from each unit of internal choice; each carrying 16 marks

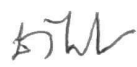
Exam Duration : 3 Hrs.

20 Marks

80 Marks


 Signature of BOS member


 Internal member


 External member

Sathyabama Institute of Science and Technology
B. Tech Chemical engineering
SCH1201: MECHANICAL OPERATIONS

Teaching Scheme:
 TH: 03 Hours/Week

Credit
 03

Examination Scheme:
 In-Sem (Paper): 50 Marks
 End-Sem (Paper): 50 Marks

Course Objectives:

1. This course is concerned with the properties, modification and separation of particulate solids.

Course outcome

1. To build a bridge between theoretical and practical concepts of unit operation used in chemical industry
2. Ability to understand fluid particle systems and equipment. Understand and apply the basic methods of characterization of particles and bulk solids,
3. Ability to select suitable size reduction equipment,
4. Be able to utilize theoretical knowledge for fundamental design of suitable, Solid-solid separation and handling.
5. Understand the operation of filter processes and types of filters used to perform solid-liquid separations.
6. Ability to analyze mixing processes using different types of mixers

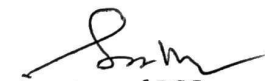
Course Contents

Unit-I	Introduction:-Scope & Application of Solid Fluid Operation. Particle Size Analysis:-Particle Size Measurement & Distribution, Sieve Analysis- Differential and Cumulative screen analysis, Specific surface area, Particle population, Different mean diameters for a mixture of particles. Particle size measurement, Surface area measurements, Statistical mean diameters, Screening Equipments : Size separation, Screening, Industrial screens, Grizzly, Gyratory and Vibratory screens, Revolving screens, Trommels, Capacity and Effectiveness of screens, Relevant equations and problems.	9Hrs
Unit-II	Principles of Comminution - Laws of crushing & Power Requirement in Milling Operations, Crushing and Grinding efficiency, Description and working of size reduction equipment, Jaw and Roll crushers, Hammer mill, Gyratory crushers, Ball mills, Revolving mills, Attrition mills, Fluid energy mill, Cutting machines, Open and Closed circuit grinding, Wet and Dry grinding, Grindability Index	9 Hrs
Unit-III	Batch sedimentation, Equipments for sedimentation, Kynch theory of sedimentation, Calculation of area and depth of continuous thickeners, Batch thickeners and Continuous thickeners. Phase separation: Centrifugal separation, Electrostatic precipitators and Magnetic separation. Gas-solid separation: Gravity settling, Impingement separators, Cyclone separators, Bag filters, Scrubbers, Mineral jig, Cyclone separator, Hydro cyclone types and Centrifuges, Centrifugal clarifier Storage and Conveying of Solids: Introduction to storage and conveying of solids, Bins, Hoppers and Silos, Flow out of bins, design consideration of bins, loading and unloading of solids. Bucket elevators, Apron conveyors. Belt conveyors: Types of Belt conveyors, Selection considerations.	9 Hrs
Unit-IV	Filter media and filter aids, Classification of filtration, Pressure drop through filter cake, Filter medium resistance, Specific cake resistance, Continuous Filtration, Washing and Dewatering of filter cakes, Centrifugal filtration.	9 Hrs
Unit-V	Necessity of mixing & agitation in chemical industries, Types of Impellers & propellers, Different flow patterns in mixing, Calculation of power requirement of mixing equipment, Mixing equipment of pastes & viscous material, Solid - Solid Mixing, Agitator selection.	9 Hrs

Text / References:

1. Warren L. McCabe, Julian C. Smith and peter Harriott, Unit Operations of Chemical Engineering, 8th Edition, McGraw Hill International Edition., New York 2009.
2. Badger and Banchero, Introduction to Chemical Engineering, 2nd Edition, McGraw Hill, 2001.
3. Coulson J.M., Richardson J.F., Backhurst J.R. and Harker J.M., Coulson & Richardson's Chemical Engineering, Vol. II, 5th Edition, Butter worth Heinemann, Oxford, 2002.
4. Brown, G.G., Unit Operations, 2nd Edition, CBS Publishers & Distributors, New Delhi, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****PART A : 10 questions of 2 marks each - No choice****PART B : 2 questions from each unit of internal choice; each carrying 16 marks****Exam Duration : 3 Hrs.****20 Marks****80 Marks**


 Signature of BOS member


 Internal member


 External member

Sathyabama Institute of Science and Technology
B. Tech Chemical engineering
SCH1203: FLUID MECHANICS

Teaching Scheme:
 TH: 03 Hours/Week

Credit
 03

Examination Scheme:
 In-Sem (Paper): 50 Marks
 End-Sem (Paper): 50 Marks

Course Objectives:

1. To acquire basic understanding of concepts and the governing principles of momentum transport in chemical process systems.

Course outcome

1. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
2. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
3. To imbibe basic laws and equations used for analysis of static and dynamic fluids.
4. To inculcate the importance of fluid flow measurement and its applications in Industries.
5. To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

Course Contents

Unit-I	Nature of fluids-properties of fluids, incompressible and compressible, hydrostatic equilibrium. Manometers U-Tube and inclined. Potential flow, boundary layer, the velocity field, laminar flow, Newtonian and Non Newtonian fluids, Newton's law of viscosity, turbulence. Reynolds number and transition from laminar to turbulent flow, Eddy viscosity, flow in boundary layers	9Hrs
Unit-II	Streamlines and stream tubes, equation of continuity, Bernoulli equation. Flow of incompressible fluids in conduits and thin layers: friction factor, relationships between skin friction parameters, average velocity for laminar flow of Newtonian fluids, Hagen-Poiseuille equation, hydraulically smooth pipe, von Karman equation, roughness parameter, friction-factor chart, equivalent diameter.	9 Hrs
Unit-III	Drag and drag coefficients. Ergun equation, terminal settling velocity, free and hindered settlings, Stokes' law, Newton's law. Fluidization, conditions for fluidization, minimum fluidization velocity.	9 Hrs
Unit-IV	Introduction to pipe and tubing, joint and fittings, stuffing boxes, mechanical seals, gate valves and globe valves, plug cocks and ball valves. Classification and selection of pumps, Reciprocating and Centrifugal pumps, developed head, power requirement, suction lift cavitation and pump work in Bernoulli equation, characteristic curves.	9 Hrs
Unit-V	Constructional features and working principles of Venturi meter, Orifice meter, Area meters-Rota meter, Point velocity-Pitot tube, V-element meter, Target meter-ultrasonic meters, vortex shredding meter, Turbine meter	9 Hrs

Text / References:

1. McCabe, W.L, Smith J.C and Harriot. P., Unit Operations in Chemical Engineering, 7th Edition, Mc-Graw-Hill, 2009.
2. Noel de Nevers, Fluid Mechanics for Chemical Engineers, 2nd Edition, McGraw-Hill, 1991.
3. Coulson J.M. and Richardson J.E., Chemical Engineering, Volume 1, 3rd Edition, Pergamon Press, 2000.
4. Shames, I.H., Mechanics of Fluids, 3rd Edition, McGraw-Hill Inc., 1992.
5. White, F.M., Fluid Mechanics, 4th Edition, McGraw-Hill Inc., 1999.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

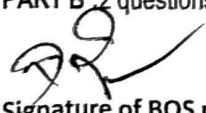
PART A : 10 questions of 2 marks each - No choice

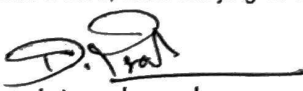
PART B : 2 questions from each unit of internal choice; each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks


 Signature of BOS member


 Internal member


 External member

Sathyabama Institute of Science and Technology
B. Tech Chemical engineering
SCH1204: CHEMICAL PROCESS CALCULATIONS

Teaching Scheme:
TH: 04 Hours/Week

Credit
04

Examination Scheme:
In-Sem (Paper): 50 Marks
End-Sem (Paper): 50 Marks

Course Objectives:

1. To perform stoichiometric calculations for chemical and non-chemical systems and to understand quantitative relationships between matter and energy involved in physiochemical processes.

Course outcome

1. Understands the basic of units and dimensions, to apply fundamental knowledge to solve domain specific engineering problems.
2. Apply the stoichiometry balance, simultaneous application of material and energy balances with and without occurrence of chemical reaction.
3. Identify, formulate, and solve engineering problems, in solving of material balances with and without chemical processes.
4. Ability to explore and apply the techniques, skills and modern engineering tools necessary to solve Chemical Engineering problems.
5. Ability to conduct investigations to solve the complex problem based on the realistic situation.

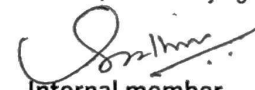
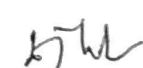
Course Contents

Unit-I	Units and Dimensions, Basic and derived units, use of model units in calculations, Methods of expressing, compositions of mixture and solutions. Gas Calculations: Ideal and real gas laws, Gas constant, Calculations of pressure, volume and temperature using ideal gas law. Use of partial pressure and pure component volume in gas calculations, applications of real gas relationship in gas calculation.	12 Hrs
Unit-II	Application of material balance to unit operations like distillation, evaporation, crystallization, extraction, absorption and stripping, drying, mixing.	12 Hrs
Unit-III	Stoichiometric principles, Limiting and excess reactant, conversion, selectivity and yield. Application of material balance to systems with recycle, bypass and purging.	12 Hrs
Unit-IV	Determination of Composition by Orsat analysis of products of combustion of solid, liquid and gaseous fuels - Calculation of excess air from orsat technique, problems on sulphur and sulphur containing compounds.	12 Hrs
Unit-V	Heat capacity of solids, liquids and gases, mean heat capacity, sensible heat and latent heat, evaluation of enthalpy, Standard heat of reaction, heat of formation, combustion, solution, mixing etc., calculation of standard heat of reaction, Effect of pressure and temperature on heat of reaction - Energy balance for systems with and without chemical reaction	12 Hrs

Text / References:

1. Himmelblau, D.M., Basic Principles and Calculations in Chemical Engineering, 6th Edition, Prentice Hall Inc., 2003.
2. Houghen. O.A., Watson. K.M and Ragatz. R.A, Chemical Process Principles, PART I, 2nd Edition, John Wiley and Asia Publishing, 1970.
3. Venkataramani, V and Anantharaman.N., Process Calculations, 2nd Edition, Prentice Hall of India Pvt. Ltd., 2003
4. Bhatt, B.L., Vora, S.M., Stoichiometry, 4th Edition, Tata McGraw-Hill, 2004.
5. Richard M. Felder, Ronald W. Rousseau, Elementary Principles of Chemical Processes, 3rd Edition, John Wiley & Sons, Inc. Singapore, 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****PART A : 10 questions of 2 marks each - No choice****PART B : 2 questions from each unit of internal choice; each carrying 16 marks****Exam Duration : 3 Hrs.****20 Marks****80 Marks**

Signature of BOS member

Internal member

External member

Sathyabama Institute of Science and Technology
B. Tech Chemical engineering
SCH1202: CHEMICAL ENGINEERING THERMODYNAMICS - 1

Teaching Scheme:
 TH: 03 Hours/Week

Credit
 03

Examination Scheme:
 In-Sem (Paper): 50 Marks
 End-Sem (Paper): 50 Marks

Course Objectives:

1. To acquire basic understanding of concepts and laws of thermodynamics, volumetric properties of fluids and thermodynamic properties of fluids

Course outcome

1. Understand the basic concepts of conservation and various laws governing thermodynamics.
2. Applications of I and II law of thermodynamics along with entropy changes/heat equipments can be understood.
3. Understand the PVT fluid behavior and various equations of states.
4. Entropy/enthalpy relations and its application towards reversible/irreversible processes.
5. Development of equations for various flow processes.

Course Contents

Unit-I	The terminologies of thermodynamics - Work, energy, heat, internal energy, extensive & intensive properties, equilibrium, the variables and quantities of thermodynamics, categorization of systems and processes. Energy classifications, point and path properties, reversible and irreversible processes, Zeroth law of thermodynamics, statements of first law for the non flow and flow systems, enthalpy and heat capacity, limitations of the first law.	9Hrs
Unit-II	Statements of the second law of thermodynamics, Heat Engines, Heat pumps, Carnot principle, The entropy function, Calculation of entropy changes - for phase change, processes involving ideal gas, adiabatic mixing process, isothermal mixing of ideal gases, chemical reactions, Clausius inequality, applications of the second law. Third law of thermodynamics.	9 Hrs
Unit-III	The PVT behaviour of pure fluids, laws of corresponding states and equation of states approaches to the PVT relationships of real gases - Vander waals equation, RedlichKwong Equation, Bertholet equation, Virial equation, compressibility factors, generalized equations of state, property estimation via generalized equation of state.	9 Hrs
Unit-IV	Measurable quantities, basic energy relations, Maxwell relations, thermodynamic formulations to calculate enthalpy, internal energy and entropy as function of pressure and temperature, other formulations involving Cp and Cv, complex thermodynamic formulations, thermodynamic properties of an ideal gas, entropy change in reversible and irreversible process.	9 Hrs
Unit-V	Flow Processes - Continuity Equation, Energy Equation, Flow through nozzles, Ejectors, compression process, classification of compression processes, the work expression for different situations, the effect of clearance volume, multistage compression, Refrigeration- Vapor compression and Vapor absorption refrigeration, Choice of refrigerant, Liquefaction processes.	9 Hrs

Text / References:

1. Smith, J.M., and Van Ness, H.C., Introduction to Chemical Engineering Thermodynamics, 6th Edition Mc-Graw-Hill, 2004.
2. Narayanan K.V, A Text Book of Chemical Engineering Thermodynamics, 3rd Edition Prentice Hall of India Pvt. Ltd. 2001.
3. Hougen, O.A., Watson, K.M., and Ragatz, R.A., Chemical Process Principles, PART II, Thermodynamics, 3rd Edition, John Wiley 1970.
4. Gopinath Halder, Introduction to Chemical Engineering Thermodynamics, 2nd Edition, PHI Learning Private Limited, 2009.
5. Rao Y.V.C., Chemical Engineering Thermodynamics, 1st Edition, University Press (I) Ltd., Hyderabad, 1997.

6. END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks : 100****PART A :** 10 questions of 2 marks each - No choice**PART B :** 2 questions from each unit of internal choice; each carrying 16 marks**Exam Duration : 3 Hrs.****20 Marks****80 Marks**


Signature of BOS member



Internal member



External member

Sathyabama Institute of Science and Technology

B. Tech Chemical engineering

SCH1211: INTRODUCTION TO UNIT OPERATIONS AND PROCESS CALCULATIONS

Teaching Scheme:

TH: 03 Hours/Week

Credit

04

Examination Scheme:

In-Sem (Paper): 50 Marks

End-Sem (Paper): 50 Marks

Course Objectives:

1. The aim of the course is to develop skills of the Students in the area of various unit operations so as to enable them to improve the design and operation of the bioprocess plant.

Course outcome

1. Learn the basic definitions, units, unit systems and symbols in unit operations and processes.
2. Understanding the flow sheets of any process.
3. Analyzing and converting the values from one unit system to other unit system.
4. Understanding the material balance and energy balance calculations.
5. Classification of fuels, analyzing the data and evaluate the fuel or flue gas composition.
6. Material and Energy balance calculations for process equipments

Course Contents

Unit-I	Unit operations, schematic representations of unit operations, Fermentation Process (Ethanol), Agrochemical (Urea, Biofertilizer), Pharmaceutical (Penicillin & Insulin), Acid (Citric acid).	9Hrs
Unit-II	Unit process- alkylation, amination, aromatization, calcination, carbonization, chlorination, cracking, dehydration, gasification, esterification, Trans esterification	9 Hrs
Unit-III	Introduction to chemical engineering, units and systems, fundamental and derived units, basic chemical calculations, mole, atomic weight, molecular weight, concepts of units and conversion factors, dimensional analysis.	9 Hrs
Unit-IV	Material Balance without chemical reaction – Distillation, Evaporation, Crystallisation and Mixing. Material Balance with chemical reaction-limiting reactant, excess reactant, conversion, and selectivity. Recycle, purge and bypass operations.	9 Hrs
Unit-V	Introduction to thermophysics and thermo chemistry, heat capacities of solid, liquid and gases at constant pressure and volume, evaluation of enthalpy, standard heat of reaction, standard heat of combustion and standard heat of formation, fuels, calorific value, proximate analysis, ultimate analysis.	9 Hrs

Text / References:

1. David H. Himmelblau, Basic principles and calculations in chemical engineering, 6th Edition, Eastern Economy 2003.
2. Warren McCabe, Julian Smith and Peter Harriott, Unit Operations of Chemical Engineering, 7th Edition., McGraw Hill Inc., New York 2005.
3. Bhatt, B.I. and Vora S.M., Stoichiometry, 3rd Edition, Tata McGraw Hill Publishing Co., 2004
4. George T. Austine, Shreves chemical process industries, 5th Edition, McGraw Hill, 1984.
5. Richard M. Felder, Ronald W. Rousseau, Elementary Principles of Chemical Processes, 3rd Edition John Wiley & Sons, Inc. Singapore, 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

PART A: 10 questions of 2 marks each - No choice

PART B: 2 questions from each unit of internal choice; each carrying 16 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

Signature of BOS member

Internal member

External member

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIO AND CHEMICAL ENGINEERING

DEPARTMENT OF CHEMICAL ENGINEERING

COURSE OUTCOME

SCH1101 – ENVIRONMENTAL SCIENCE AND ENGINEERING – (Dr.S.Sathish)

- Understand the importance of the Environment.
- Identify the Environmental impact due to Human activities.
- Identification of prevention and control measures of various pollution
- Identify the threats to biodiversity and the ways for Conservation of Biodiversity
- Understand the water stress problems and energy crisis in present era.
- Understand the concept of Disaster Management.
- Issues involved in enforcement of environmental legislation

SCH1205- ENERGY ENGINEERING – (Dr.A.A.Renita)

- Understand ^{various} ~~energy sources which are~~ conventional and non- conventional ^{energy sources} ~~in nature~~
- Evaluate the advantages and disadvantages of various types of bio gas generators
- Demonstrate the working principle of biomass gasifiers
- Classify wind energy conversion systems
- Compare the various methods of generating ocean thermal electric power
- Demonstrate the working principle of various kinds of fuel cells.

SCH1202 - CHEMICAL ENGINEERING THERMODYNAMICS – I – (Mr.J.Aravind)

- ~~Students were able to~~ understand the basic concepts of conservation and various laws governing thermodynamics.
- Applications of I and II law of thermodynamics along with entropy changes/heat equipments can be understood
- ~~The~~ ^{understand the} PVT fluid behavior and various ^{equation of} ~~ideal gas states can be understood.~~
- Entropy/enthalpy relations and its application towards reversible/irreversible processes ~~can be identified.~~
- Development of equations for various flow processes ~~can be described.~~

SCH1204 – CHEMICAL PROCESS CALCULATIONS - (Dr.S.Sathish)

- Understands the basic ⁵ ~~of~~ units and dimensions, to apply the ^{fundamental knowledge} ~~knowledge of mathematics, science and engineering~~ to solve domain specific engineering problems.
- Apply the stiochiometry balance, simultaneous application of material and energy balances with and without occurrence of chemical reaction.
- Identify, formulate, and solve engineering problems, in solving of material balances with and without chemical processes.

HEAD OF THE DEPARTMENT
DEPARTMENT OF CHEMICAL ENGINEERING
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Chennai - 600 119

- Ability to explore and apply the techniques, skills and modern engineering tools necessary to solve Chemical Engineering problems.
- Ability to conduct investigations to solve the complex problem based on the realistic situation.
- ~~Ability to perform simultaneous material and energy balances.~~

SCH1203 - FLUID MECHANICS – (Dr.D.Prabu)

- To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
- To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
- To imbibe basic laws and equations used for analysis of static and dynamic fluids.
- To inculcate the importance of fluid flow measurement and its applications in Industries.
- To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

SCH1201 - MECHANICAL OPERATION – (Dr. D. Joshua Amarnath)

- To build a bridge between theoretical and practical concepts of unit operation used in chemical industry
- Ability to understand fluid particle systems and equipment. Understand and apply the basic methods of characterization of particles and bulk solids,
- Ability to select suitable size reduction equipment,
- Be able to utilize theoretical knowledge for fundamental design of suitable. Solid-solid separation ~~method and conveying system.~~ *and design handling*
- Understand the operation *and design handling* of filter processes and types of filters used to perform solid-liquid separations, ~~and calculate the pressure drop and washing time of filters~~
- Ability to analyze mixing processes using different types of mixers

SCH1211 - INTRODUCTION TO UNIT OPERATIONS AND PROCESS CALCULATIONS – (Mr.P.Senthilkumar)

- Learn the basic definitions, units, unit systems and symbols in unit operations and processes.
- Understanding the flow sheets of any process.
- Analyzing and converting the values from one unit system to other unit system.
- Understanding the material balance and energy balance calculations. ~~Evaluating the values using material and energy balances.~~
- Classification of fuels, analyzing the data and evaluate the fuel or flue gas composition.

- Material and Energy balance calculations for ~~Complete process plant~~ ^{process equipments}

SCH5116 - PRINCIPLES OF CHEMICAL ENGINEERING – (Mr.D.Venkatesan)

- The basic principles and techniques used for calculations of material ~~balance~~ ^{balance} and Energy balance in chemical engineering processes.
- To understand the behavior of fluids, and mixing system in bioprocess industries.
- Students acquire knowledge in Heat transfer operations ^{and} their applications.
- Understanding the principle of mass transfer operations ^{mainly} diffusion in fluids and their applications.
- Student gain knowledge in chemical kinetics and to calculate rate and order of reaction from experimental data.
- Solve practical problems related to process industry.



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INSTITUTE OF SCIENCE AND TECHNOLOGY
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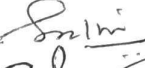
SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES HELD ON 07TH Feb 2018.

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute of Science and Technology

The following members were present in the meeting:

1. Dr. Anima Nanda – Dean – Chair Person 
2. Dr. Mukesh Doble – Professor – IIT Madras – External member 
3. Dr. A. Annam Renita – Professor – Head of the Department 
4. Dr. S. Sathish – Associate Professor – Internal member 
5. Dr. D. Prabu – Associate Professor – Internal member 
6. Dr. D. Joshua Amarnath – Professor – Internal member 
7. Dr. S. S. Dawn – Professor – Head (Centre for Waste Management) – Internal member 
8. Dr. J. Aravind Kumar – Asst. Professor – Internal member 
9. 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. The minutes of BoS meeting was held on 07th Feb. 2018, were reviewed and approved by the members. The comments were placed in 14th Academic Council and the same was approved.

2. Agenda item # 1 Introduction of Professional Training II

Based on the feedback from the experts Head of the Department proposed introduction of phase II of professional training in sixth semester which is mandatory for all students to industry related preparedness to develop the industrial and technical skill.

Resolutions: The External members approved the proposal of the Head of Department to have professional training in two phases which will benefit the students.

CHEMICAL ENGINEERING





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3. Agenda item # 2 Shifting of SCH1403-Process Engineering Economics

Shifting of subject SCH1403-Process Engineering Economics from seventh semester to eighth semester was proposed in order to balance the credits in the curriculum.

Resolutions: BOS members had a thorough discussion in credits calculation and resolved to approve the shifting of the subject to the eighth semester.

The members had the interaction and discussion for incorporating the relevant comments appropriately in the syllabus and curriculum.

Head of the Department thanked the members for their cooperation and valuable input for enhancing the curriculum.

CHEMICAL ENGINEERING

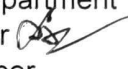
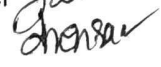
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES- HELD ON 23rd JUNE 2017.

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute of Science and Technology

The following members were present in the meeting:

1. Dr. Anima Nanda – Dean – 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.D.Joshua Amarnath – Professor –Head of the Department
5. Dr.D.Prabu – Associate Professor – Internal member 
6. Dr.S.Sathish – Associate Professor – Internal member
7. Dr.A. Annam Renita – Associate Professor – Internal member
8. Dr. S.S.Dawn – Professor – Head (Centre for Waste Management) – Internal member
9. Mr.J.Aravind Kumar – Asst. Professor – Internal member 
10. Mr.D.Venkatesan – Asst. Professor – Internal member 

The meeting was conducted in the presentation hall of the Department and the Chair Person of the Board of Studies welcomed the members for their presence and discussions.

1. Agenda item # 1 Merging of Inorganic Chemical Technology and Organic Chemical Technology as SCH1304 Chemical Process Technology.

Head of the Department informed that the department teams have been working on the merging of the above mentioned subjects into a single subject as Chemical Process Technology for better understanding of students and it paves for a new course to be added.

Resolutions: The BOS members resolved to combine and approve the syllabus of Chemical Process Technology.



2. Agenda item # 2 Introduction of new course SCH1301 Computational methods in Chemical Engineering

Automation of processes in chemical industries is the current development in industrial technologies and it was proposed that a new course on computational methods in Chemical Engineering will be an added advantage.

Resolutions: Approved as Recommended and BOS members suggested to include in fifth semester

3. Agenda item # 3 Modifications in SCH1302 Mass Transfer II

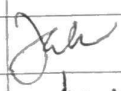
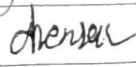
New topics on extraction and leaching like Bollman extractor, Rotocel extractor and elaborate discussions on industrial applications of leaching can be introduced for upgradation of student knowledge

Resolutions: The BoS approved the inclusion of the topics to be included in Unit 5

4. Agenda item # 4 Introduction of new course SCH1306 Process Engineering

Head of the Department recommended the introduction of Process Engineering subject so that students will have a knowledge of heuristics and scaling of processes.

Resolutions: The Members had thorough discussion and approved the subject Board of studies members recommended the above resolutions to be presented in the Academic Council meeting for further approval. The Head of the Department thanked all the members for their kind cooperation and ended the meeting with vote of thanks

S.No	Name of the Member	Designation	Signature
1.	Dr. Anima Nanda	Professor & Dean, School of BCE	
2.	Dr.D.Joshua Amarnath	HOD/CHEM	
3	Dr.D.Prabu	Associate Professor	
4	Dr.S.Sathish	Associate Professor	
5	Dr. S.S.Dawn	Professor	
6	Dr. A.Annam Renita	Associate Professor	
7	Mr.J.Aravind Kumar	Asst. Professor	
8	Mr.Venkatesan.D	Asst. Professor	



Modification	CHEMICAL PROCESS TECHNOLOGY	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE: This course helps the students to understand the various processes involved in chemical industries for the production of organic and inorganic chemicals

UNIT 1 INTRODUCTION - CHLORO ALKALI INDUSTRIES

9 hours.

Introduction - Basic principles of unit operations and unit process to common devices used in manufacturing processes like Reactors, Steam jet ejectors, Pumps, Thickeners, Dryers, Electrostatic precipitators, Condenser, Vacuum evaporator in block diagram - Standard symbols used for such devices, Process flow sheet. Manufacturing of soda ash, caustic soda and chlorine - manufacture of bleaching powder.

UNIT 2 SULPHUR, SULPHURIC ACID AND SILICATE INDUSTRIES

9 hours.

.Mining and manufacture of sulphur, recovery of sulphur from polluting gases, sulphur trioxide and sulphuric acid, hydrochloric acid, sodium sulphate, sodium thiosulphate. Manufacture of Portland cement, Manufacture of Glasses and Special glasses.

UNIT 3 INDUSTRIAL GASES AND PAINTS

9 hours.

Manufacture of Carbon dioxide, Hydrogen, Oxygen, Nitrogen, Acetylene, Water Gas, Producer Gas, Production of Natural Gas. Introduction of Paints, Pigments, Emulsions and Varnishes, Manufacture of Paints, Manufacture of White and Coloured Pigments.

UNIT 4 NATURAL PRODUCTS

9 hours.

Edible and essential oils, soaps and detergents, glycerin, pulp and paper, starch and its derivatives, Manufacturing of sugar.

UNIT 5 SYNTHETIC ORGANIC CHEMICALS

9 hours.

Methane and synthesis gas, ethylene, acetylene and propylene. Aromatic chemicals - Benzene, toluene, and xylene. Production of thermo-plastic and thermo-setting resins: polyethylene, polypropylene, and Polyvinylchloride, Polymers and their engineering applications. Polyamides and polyesters and processes for the production of natural and synthetic rubber.

Course Outcomes:

- CO1.Study importance and components of chemical engineering.
- CO2 Concepts of unit operations and unit processes.
- CO3 Knows current scenario of chemical & allied process industries.
- CO4 Understands the manufacturing of various inorganic chemicals.
- CO5 Understands the manufacturing of various inorganic chemicals..
- CO6 Identifies and solve engineering problems during production.

REFERENCE BOOKS:

1. Gopala Rao. M. and Marshall Sittig, "Dryden's Outlines of Chemical Technology", 3rd Edn., EastWest Press, New Delhi, 2008
2. George .T Austin, "Shreve's Chemical Process Industries", 8th Edn., McGraw-Hill International Editions, Singapore, 2002.
3. Srikumar Koyikkal,"Chemical Process Technology and Simulation",3rd Edn PHI Learning Ltd ,2013.
4. Shukla and G.N. Pandey "Text book on Chemical Technology", 2 nd Edn,Vikas publishing company ,2001

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100

Part A: 10 questions of 2 marks each - No choice

Part B: 2 questions from each unit of internal choice, each carrying 16 marks

Examination duration: 3 Hours

20 Marks

80 Marks

New course	PROCESS ENGINEERING	L	T	P	C	Max. Marks
		3	0	0	3	100

COURSE OBJECTIVE:

- To provide an adequate knowledge on process engineering and their applications in process industries.

UNIT 1: INTRODUCTION**9 Hours**

Scales of Production, Selection of Plant Capacity, Plant Location. Availability of Raw Materials, Energy Gestation Period. Expansion, Diversification and Obsolescence. Scope for Standardization in Design and Production. Economics of Research and Development. Indian Chemical Industry, Current Status and Trends.

UNIT 2: PROCESS CREATION**9 Hours**

Preliminary database creation, Preliminary process synthesis, Development of base case design, Generalization of the Resolution Based Synthesis procedure for development of flow sheet for a chemical plant. Principles of steady state flow sheet, simulation, Principles of batch process simulation.

UNIT 3: HEURISTICS FOR PROCESS SYNTHESIS**9 Hours**

Raw materials and Chemical reactions, Distribution of chemicals, Separations, Heat removal from and addition to reactors, Heat exchangers and furnaces, Pumping, Compression, Pressure reduction, Vacuum, and Conveying of solids.

UNIT 4: SYNTHESIS OF SEPARATION TRAINS**9 Hours**

Feed separation systems, Phase separation of reactor effluent, Industrial separation operations, Criteria for selection of separation methods, Selection of equipment, Sequencing of ordinary distillation columns for the separation of nearly ideal fluid mixtures, Sequencing of operations for the separation of nonideal fluid mixtures, Separation systems for gas mixtures, Separation sequencing for solid-fluid systems.

UNIT 5: SCALING UP PROCESS**9 Hours**

Scaling up of process from laboratory to pilot plant and to industrial scale. Process Evaluation: Batch Versus Continuous, Equilibrium Limitations, Process alternatives, Preparation of study report.

Max.45 Hours**COURSE OUTCOMES:**

- CO1. Factors to be considered before starting an industry and selection & designing of plant location.
- CO2. Selection of various processes and Creation of process flow sheets.
- CO3. Optimizing the process using heuristics.
- CO4. Selection of separation technique suitable for the process.
- CO5. Scaling up of the process from pilot scale to industrial scale.
- CO6. Designing the process plant from selection of site to designing of the plant.

TEXT / REFERENCE BOOKS

- Vogel.G.H., Process Development - From the Initial Ideal to the Chemical Production Plant, 2nd Edition, Wiley- VCH Verlag GmbH, 2005.
- Douglas. J. M., Conceptual Design of Chemical Process, 4th Edition Mc Graw Hill Book Company. 2001.
- Amiya K. Jana, "Chemical Process Modelling and Computer Simulation" 2nd Edn, PHI Learning Ltd, 2012.
- Seider W.D, Seader J.D, and Lewin D.R., Product and Process Design Principles-Synthesis, Analysis and Evaluation, 2nd Edition, John Wiley and Sons. 2004.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100

Part A: 10 questions of 2 marks each - No choice

Part B: 2 questions from each unit of internal choice; each carrying 16 marks

Examination duration: 3 Hours

20 Marks

80 Marks



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
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SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES 3rd JAN 2017

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute of Science and Technology

The following members were present in the meeting:

1. Dr. Anima Nanda – Dean – Chair Person
2. Dr. Mukesh Doble - Professor – IIT Madras – External member
3. Dr. D. Joshua Amarnath – Professor – Head of the Department
4. Dr. D. Prabu – Associate Professor – Internal member
5. Dr. S. Sathish – Associate Professor – Internal member
6. Dr. A. Annam Renita – Associate Professor – Internal member
7. Dr. S. S. Dawn – Professor – Head (Centre for Waste Management) – Internal member
8. Mr. J. Aravind Kumar – Asst. Professor – Internal member
9. Mr. D. Venkatesan – Asst. Professor – Internal member *Anima*

The meeting was chaired by Dr. Anima Nanda, Faculty Head, Faculty of Bio and Chemical Engineering and co-chaired by Dr. D. Joshua Amarnath, Head of the Department of Chemical Engineering. The minutes of BoS meeting was held on 3rd JAN 2017, were reviewed and approved by the members. The comments were placed in 12th Academic Council and the same was approved.

1. Agenda item # 1 Modifications in SCH1206 Mass Transfer 1

Distillation and Absorption have been introduced as Unit-3 and Unit-4 in order for elaborately explanations to meet industrial requirements

Recommendations: The External members considered the proposal. Dr. Joshua Amarnath. D informed that the need for the modification is for placement opportunities

2. Agenda item # 2 Introduction of Professional Training-I

- The Head of the department highlighted the importance of the curriculum design and development is to prepare students to have practical experience for them to meet industry demands and to meet research requirements

Recommendations: Members agreed that professional training is mandatory for student preparedness for industry and research

3. Agenda item # 3 Changes in SCH1209 Biochemical Engineering

Biochemical kinetics was introduced as Unit-4 with emphasis on models

CHEMICAL ENGINEERING



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Resolutions: Approved as recommended.

Chair person thanked all members for their resourceful inputs and expressed gratitude in enhancing the curriculum

S.No	Name of the Member	Designation	Signature
1.	Dr. Anima Nanda	Professor& Dean, School of BCE	
2.	Dr.D.Joshua Amarnath	HOD/CHEM	
3	Dr.D.Prabu	Associate Professor	
4	Dr.S.Sathish	Associate Professor	
5.	Dr. S.S.Dawn	Professor	
6.	Dr. A.Annam Renita	Associate Professor	
7.	Mr.J.Aravind Kumar	Asst. Professor	
8.	Mr.Venkatesan.D	Asst. Professor	

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIO AND CHEMICAL ENGINEERING

Department of Chemical Engineering

MINUTES OF BOARD OF STUDIES held on 9th June 2016

Venue: Presentation Hall, Department of Chemical Engineering, Sathyabama Institute of Science and Technology

The following members were present in the meeting:

1. Dr. Anima Nanda – Dean – Chair Person
2. Dr. Mukesh Doble – Professor – IIT Madras – External member
3. Dr. D. Joshua Amarnath – Professor – Head of the Department
4. Dr. D. Prabu – Associate Professor – Internal member
5. Dr. S. Sathish – Associate Professor – Internal member
6. Dr. A. Annam Renita – Associate Professor – Internal member
7. Dr. S. S. Dawn – Professor – Head (Centre for Waste Management) – Internal member
8. Mr. J. Aravind Kumar – Asst. Professor – Internal member
9. Mr. D. Venkatesan – Asst. Professor – Internal member – *dhennar* ✓

The meeting was chaired by Dr. Anima Nanda, Faculty Head, Faculty of Bio and Chemical Engineering and Dr. D. Joshua Amarnath, Head of the department, Department of Chemical Engineering. The external members were greeted by the internal members. The minutes of BoS meeting was held on 9th June 2016, were reviewed and approved by the members.

1. Agenda item # 1 Introduction of new lab course SCH4052

Head of the Department proposed new lab course SCH4052 Organic Chemical Process & Thermodynamics lab

Recommendations: The syllabus of the proposed lab was discussed by external members which was prepared by Dr. Satish. S. and Mr. J. Aravind Kumar and was approved.

CHEMICAL ENGINEERING

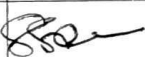
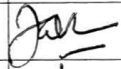


2. Agenda item # 2 Modifications in SCH1204 Chemical Process Calculation

Based on Industrial expert feedback, modifications in Unit 2,3 and 4 were suggested and
Material Balance Without Chemical Reaction was addressed in Unit2 , Material Balance
With Chemical Reaction in Unit 3 and Fuels and combustion was addressed in Unit 4.

Recommendations:The external members agreed to the modifications since they felt
that students should be trained in material and energy balances in these topics.

The meeting ended with a vote of thanks by Dr. Anima Nanda to the members for their
valuable input.

S.No	Name of the Member	Designation	Signature
1.	Dr. Anima Nanda	Professor& Dean, School of BCE	
2.	Dr.D.Joshua Amarnath	HOD/CHEM	
3	Dr.D.Prabu	Associate Professor	
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5.	Dr. S.S.Dawn	Professor	
6.	Dr. A.Annam Renita	Associate Professor	
7.	Mr.J.Aravind Kumar	Asst. Professor	
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