

**Minutes of Board of Studies Meeting:
Department of Chemical Engineering
School of Technology (SoT),
Pandit Deendayal Energy University
Gandhinagar, Gujarat-382426**

Date: 26-05-2022
Time: 9.30 AM – 10.45 AM
Venue: Microsoft Teams Platform

A. Members of Board of Studies

Name of BoS Member	Name of Organization and Designation	Present / Absent	Remarks
Prof. Sameer Dalvi	IIT Gandhinagar, Professor	Absent	
Prof. Sunil S. Bhagwat	ICT Mumbai, Professor	Present	
Mr. Vijay Vasudeva	Meghmani Dyes and Intermediates	Present	
Mr. Nilesh Mangukia	Linde Group	Absent	
Miss Monideepa Karmakar	Deputy Manager, GSFC; PDEU Alumni	Present	
Mr. Ankit Pahwa	Process Design Engineer, Jacobs PDEU Alumni	Present	
Dr. Rajesh Patel	Dean-FOET (PDEU)	Present	
Dr. Swapnil Dharaskar	BOS Chairman & Head (Chemical Engineering)	Present	
Dr. Manish Kumar Sinha	Assistant Professor (PDEU)	Present	
Dr. Abhishek Kumar Gupta	Assistant Professor (PDEU)	Present	
Dr. Anirban Dey	Assistant Professor (PDEU)	Present	

B. Agenda of Meeting:

B1. M.Tech.

- I. The course entitled “Energy & Environment – Policy, Planning & Climate Change” will be renamed as “Energy & Environment – Policy, Planning & Auditing”, and the course “Energy Auditing” will be removed from Semester- 1 of MTech. -Energy & Environmental Management.
- II. The credit of the course “*Energy & Environment Ecosystem*” will be changed from 2 to 3.
- III. The “Energy and Environmental Research Lab – 1” in M.Tech. – Energy & Environmental Management and “Advance Chemical Engineering Lab” in M.Tech. – Chemical Engineering (both) will be renamed as “Material characterization Lab”.
- IV. The credit for renamed “Material characterization Lab” in M.Tech.–Energy & Environmental Management program will be changed from 1 to 2.
- V. The elective course “Modelling and Simulation” in Semester-2 of the M.Tech - Chemical Engineering program will be renamed as “Materials Modelling and Simulation Techniques”.

B2. B.Tech (Chemical Engineering)

- I. New subject “Energy Conversion device Engineering” with Laboratory component can be added in the Professional Core Elective basket (PCE-VI) -7th Sem.
- II. “Corrosion Engineering” subject can be tuned in line with the common interest of other disciplines and it can be reframed as “Corrosion Prevention and control” as it is included in Open elective basket (OE-II, 4thsem)
- III. “Corrosion Engineering” needs to be shifted to Professional Core elective-II basket – 5th Sem.
- IV. The Course Content of following subject needs to be revised
 - (a) Chemical Process technology
 - (b) Process Equipment design
 - (c) Instrumentation and Process Control
 - (c) Intellectual Property Rights
 - (d) Membrane Processes

C. Minutes of BoS Meeting:

- **Dr. Swapnil Dharaskar, Chairman BOS** welcomed all the BOS External as well as Internal members and briefed us about the ongoing academic activities of the department as well as various initiatives taken by the department in view of the current Hybrid model of Teaching-learning pedagogy. The session was then kept open for the discussion pertaining to all the agenda points
- **Agenda:** The course entitled “Energy & Environment – Policy, Planning & Climate Change” will be renamed as “Energy & Environment – Policy, Planning & Auditing”, and the course “Energy Auditing” will be removed from Semester- 1 of MTech. - Energy & Environmental Management.
Discussion: The BOS experts including Dr. Bhagwat and Mr. Vasudeva agreed to the changes proposed in line with the renaming of the course “Energy & Environment – Policy, Planning & Climate Change” to “Energy & Environment – Policy, Planning & Auditing”, and the removal of the course “Energy Auditing” will. **The following change will be effective from next academic year (AY-2022-23)**
- **Agenda:** *The credit of the course “Energy & Environment Ecosystem” will be changed from 2 to 3.*
Discussion: The BOS experts including Dr. Bhagwat and Mr. Vasudeva agreed to the change in the credit of the course “Energy & Environment Ecosystem” from 2 to 3. Dr. Rajesh Patel insisted that the total credits of the entire semester must remain unchanged after this restructuring in the credit of the aforementioned course. The internal BOS members will make sure the same will be followed. **The change will be effective from the next academic year (2022-2023).**
- **Agenda:** *The “Energy and Environmental Research Lab – 1” in M.Tech. – Energy & Environmental Management and “Advance Chemical Engineering Lab” in M.Tech. – Chemical Engineering (both) will be renamed as “Experiment and Software Lab”.*
Discussion: The BOS experts including Dr. Bhagwat and Mr. Vasudeva agreed to the renaming of both the labs in these programs (M.Tech. – Energy & Environmental Management and M.Tech. – Chemical Engineering) to “Experiment and Software Lab”. **The changes will be effective from next academic year (2022-23)**

- **Agenda:** *The credit for renamed “Lab” in M.Tech.–Energy & Environmental Management program will be changed from 1 to 2.*

Discussion: Dr. Bhagwat emphasized that the renamed “Experiment and Modeling lab” must have 2 credits instead of 1 for keeping in view that it’s in M.Tech. program. Dr. Vasudeva also agreed with the proposed change. **The changes will be effective from the current Academic year (2022-23).**

- **Agenda:** *The elective course “Modelling and Simulation” in Semester-2 of the M.Tech - Chemical Engineering program will be renamed “Materials Modelling and Simulation Techniques”.*

Discussion:The elective course “Modelling and Simulation” Semester-2 of the M.Tech. - Chemical Engineering program was introduced keeping in view teaching the PG students about Material Modeling and Simulation Techniques. Therefore, the following change was proposed. The renaming of the same to “Materials Modelling and Simulation Techniques” was unanimously supported by BOS experts Dr. Bhagwat and Mr. Vasudeva. **The changes will be effective from this current AY (2022-23).**

- **Agenda:** New subject “Energy Conversion device Engineering” with Laboratory component can be added in the Professional Core Elective basket (PCE-VI) -7th Sem.

Discussion:The new course “Energy Conversion device Engineering”(syllabus in **Annexure-I**) has been felt important in highlighting the current scenario in electrochemical storage devices such as fuel cells, batteries, and Photochemical cells. Mr. Vasudeva suggested that it is required as it presents current trends with respect to both industries as well as academia. Ankit Pahwa also indicated that its lab component (**Annexure-I**) will be helpful for the students as electric car companies are focusing on a significant investment. The changes will be effective from the next academic year **AY (2022-23).**

- **Agenda:** *“Corrosion Engineering” subject can be tuned in line with the common interest of other disciplines and it can be reframed as “Corrosion Prevention and control” as it is included in Open elective basket (OE-II, 4thsem).*

Discussion: The reframing of the course “Corrosion Engineering” as “Corrosion Prevention and control” was required as explained by Dr. Ravi during the meeting. The detailed syllabus is shown in **Annexure-I**. Dr. Vasudeva insisted that the

latest techniques regarding corrosion measurement must be taken by industry experts pertaining to this course. The changes will be effective from the next academic year **AY (2022-23)**.

- **Agenda:** “Corrosion Engineering” needs to be shifted to Professional Core elective-II basket – 5th Sem.

Discussion: The following change was agreed by all the BOS experts. The changes will be effective from the next academic year **AY (2022-23)**.

- **Agenda:** The Course Content of following subject needs to be revised

(a) Chemical Process technology

(b) Process Equipment design

(c) Instrumentation and Process Control

(c) Intellectual Property Rights

(d) Membrane Processes

Discussion: The changes in the syllabus of the courses in line with the agenda has been highlighted in **Annexure-II**. Dr. Vasudeva and Ankit stressed the addition of evaporators in the course syllabus on process equipment design will be required and necessary keeping in view their key usage in different chemical process industries. In the process equipment design lab, open-source software will be introduced and simulations of all earlier set experiments and multi-effect evaporator (process simulations and calculations). Dr. Vasudeva and Ankit have agreed upon the revisions introduced in the same. The course “Instrumentation and process control” has been revised pertaining to its syllabus. Dr. Vasudeva insisted on the importance of practical knowledge apart from theoretical knowledge. Ankit also indicated that the practical aspects must be added in the form of video lectures can be added. The concepts related to bio-ethanol and bio-butanol will be added in the chemical process technology course. Mr. Vasudeva also indicated eliminating cement manufacturing as it’s a primitive process from CPT course. He also indicated that discussion on downstream products will be required. In the course “Membrane Processes”, shifting of topics will be done between the units, and omitting some topics will be done. The BOS experts have agreed with the proposed changes. The course “Intellectual property rights” in M.Tech. program will be made as a 1 credit course and restructuring is done in its syllabus. Dr. Vasudeva and Ankit (alumni) agreed to the proposed changes. The changes will be effective from the next academic year **AY (2022-23)**.

General Discussion and Recommendation by BoS Members:

None

Name of BoS Member – I Prof. Sameer Dalvi	Name of BoS Member – II Prof. SS. Bhagwat	Name of BoS Member – III Mr. Vijay Vasudeva	Name of BoS Member – IV Dr. Swapnil Dharasakr
Absent			

Name of BoS Member – V Dr. Manish Kumar Sinha	Name of BoS Member – VI Dr. Abhishek Kumar Gupta	Name of BoS Member – VII Dr. Anirban Dey

Note: Take the signature of all the members present in BoS

Annexure-I

<Course_Code>					Energy Conversion Device Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					IA-1	IA-2	ESE	LW	LE/Viva	
3	0	0	3	3	30	30	40	--	--	100

UNIT 1 Introduction and Basic Principles

12 Hrs.

Electrochemical Cells, Characteristics of Electrochemical Reactions, Importance of Electrochemical Systems, Faraday's Law, Cell Potentials, Nernst equation and variants, Standard Potentials, Use of the Cell Potential, Pourbaix Diagrams, Reference Electrodes, Impact of Potential on Reaction Rate, Butler-Volmer equation, the influence of Mass Transfer on the Reaction Rate, Kinetics in full cells, various efficiency measurements in the Electrochemical Systems, Electric and Hybrid Systems, Power Demand in Vehicles, Hybrid Vehicle Architectures

UNIT 2 Battery Fundamentals

09 Hrs.

Components of a Cell, classification of Batteries and Cell chemistries, Theoretical Capacity and the State of Charge, Cell Characteristics and Electrochemical Performance, Ragone Plots, Efficiency of Secondary Cells, Charge Retention and Self-Discharge, Capacity Fade in Secondary Cells, Redox-Flow Batteries, Scaling of Cells to Adjust Capacity, Thermal management, Mechanical Considerations, Battery Electrical Vehicles, Batteries for Full-Hybrid Electric Vehicles

UNIT 3 Fuel-Cell Fundamentals

09 Hrs.

Types and components of Fuel Cells, Current-Voltage Characteristics and Polarizations, Effect of Operating Conditions and Maximum Power, Electrode Structure, Proton-Exchange Membrane Fuel Cells, Solid Oxide Fuel Cells, Basic Stack Design Concepts, Cell Stack Configurations, Utilization of Oxidant and Fuel, Flow-Field Design, Water and Thermal Management, Structural-Mechanical Considerations, Fuel-cell Hybrid Systems for Vehicles

UNIT 4 Photoelectrochemical Cells and Electrochemical Double -Layer Capacitors

10 Hrs.

Semiconductor Basics, Energy Scales, Semiconductor-Electrolyte Interface, Current Flow in the Dark, Light Absorption, Photoelectrochemical Effects, Photo-Electrochemical Cells, Electrical Double-Layer Capacitance, Current-Voltage Relationship for Capacitors, Electrode structure, Impedance Analysis, Full Cell analysis, Power and Energy Capabilities, Cell Design, Practical Operation, and Electrochemical Capacitor Performance, Pseudo-Capacitance, Applications in Hybrid and Electrical Vehicles

<Course_Code>					Energy Conversion Device Engineering Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	2	1	2	-	-	-	50	50	100

List of Experiments

1. Introduction to various testing procedures and protocols
2. Current-voltage and power characteristics of batteries under charging conditions
3. Current-voltage and power characteristics of batteries under discharging conditions
4. Impedance characteristics of batteries under charging conditions
5. Impedance characteristics of batteries under discharging conditions
6. Battery reliability under successive charging and discharging
7. Current-voltage and power characteristics of solar panels under dark and illumination
8. Impedance characteristics of solar panels under dark and illumination
9. Current-voltage characteristics of Photoelectrochemical hydrogen generation system
10. Impedance characteristics of Photoelectrochemical hydrogen generation system
11. Reliability test of solar panels and Photoelectrochemical hydrogen generation system

<Course_Code>					Corrosion Prevention and Control					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					IA-1	IA-2	ESE	LW	LE/Viva	
3	0	0	3	3	30	30	40	--	--	100

UNIT 1 Introduction and Fundamentals of Corrosion

Definitions of Corrosion, Overall classification of types of corrosion, Basic electrochemistry, Galvanic, and electrolytic cells, Potential measurements, Galvanic corrosion, bimetallic contacts, Eh - pH diagrams, Electrode kinetics, Polarization phenomena, Polarization techniques to measure corrosion rates, Cost of Corrosion, Metallurgical properties influencing corrosion, General Testing procedures,

UNIT 2 Types of Corrosion

Uniform attack, Galvanic corrosion, Crevice corrosion, Pitting corrosion, Intergranular corrosion, Selective leaching, Erosion corrosion, Stress corrosion, Mechanisms, Testing procedures

UNIT 3 Electro-chemical Methods of Corrosion Prevention and Control

Mixed potential theory, Cathodic protection, stray current corrosion, Anodic control, Electrochemical coatings, speciality coatings and surface protection

UNIT 4 Mechano-chemical Methods of Corrosion Prevention and Control

Design, Mechanical and non-electrochemical coatings, corrosion inhibition, Passivity phenomena and development of corrosion-resistant alloys.

Max. 40 Hrs.

Annexure-II

20CH310T					Instrumentation and Process Control					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

Unit 1

Introduction and Motivation to do process control, Block diagram representation, Input-output model of a process, Time and Frequency domain representation of processes, Laplace transform, Inverse Laplace transform, and Transfer functions, **different types of input functions- delta, step, ramp, sinusoidal etc., defining piecewise continuous functions in terms of step input**

Unit 2

First-order systems, Linearization, Second-order systems, **Stability analysis using system poles, Routh's stability test**, Feedback control, Introduction of P, PI, PID controllers, Servo & Regulatory control, Simplification of complex block diagrams

Unit 3

Frequency domain analysis, Bode stability criterion, Bode plots, **Controller tuning – stability, and direct synthesis methods, Problem of inverse response and dead time in processes**

Unit 4

Transducers and their dynamics, **Temperature measurement, Flow measurement, Pressure measurement, and Level measurement**

20CH207T					Chemical Process Technology					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	1	3	4	25	50	25	--	--	100

UNIT 1 <Introduction and Raw Materials>

4 Hrs.

Brief History of Organic and Inorganic Chemicals, Structure of the Chemical Industry, Raw Materials and Energy (Fossil fuels, oleochemicals and biomass, sulphuric acid, nitrogen glass etc.) role of sustainability, National and Global Trends in the Chemical Industry. Raw materials and principals involved in the production of olefins, aromatics and novel developments in technology.

UNIT 2 <Organic industries I>

13 Hrs.

Important intermediates from olefins and aromatics: petrochemical derivatives of C1, C2, C3, C4 olefin compounds and Aromatics,

Biotech Industry (esp. ethanol, biobutanol etc.)

UNIT 3 <Organic industries II and Inorganic Industries I>

14 Hrs.

*Bio-refinery and Process for biomass conversion- Production useful chemicals from Oleochemical feedstocks, Biodiesel and biofuel production using conventional and process intensification approach, concept,

Inorganic Chemicals : sulphuric acid (DOSA and DCDA process), Nitric acid, Hydrochloric acid Phosphoric acid.

Cement manufacturing, Ceramics manufacturing processes

UNIT 4 <Inorganic Industries II>

11 Hrs.

*Nitrogen Industries: Manufacturing of ammonia, Nitrogenous and Mixed fertilizers: Urea, Ammonium sulphate, Ammonium nitrate, **Superphosphates and Mixed fertilizers etc.**

Chlor-Alkali Industries: Caustic soda, Chlorine, Soda ash and Sodium bicarbonate.

