



List of Revised Courses

Department : **Chemical Engineering**

Program Name : **B.Tech.**

Academic Year : **2018-19**

List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	CH7TPC15	New Separation Processes
02.	CH7TPE41	Petroleum Refinery Engineering
03.	CH8TPC17	Project Engineering, Economics & Management
04.	CH8TPE51	Petrochemical Technology
05.	CH8TOE41	Optimization Techniques
06.	CH01TBS01	Physics
07.	CH01TES01	Basic Electrical Engineering
08.	CH01TBS02	Mathematics-I
09.	CH01TMC01	Environmental Studies
10.	CH01PBS01	Physics Lab
11.	CH01PES01	Basic Electrical Engineering Lab
12.	CH01PES02	Engineering Graphics & Design Lab
13.	CH02TBS03	Mathematics-II
14.	CH02TBS04	Chemistry
15.	CH02TES03	Thermodynamics



Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2018-19

School : School of Studies of Engineering and Technology

Department : Chemical Engineering

Date and Time : May 15, 2018 - 11:00 AM

Venue : HoD room

Minutes of Meeting

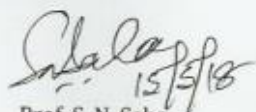
The scheduled meeting of members of Board of Studies (BOS) was held today (15th May 2018) in the office of the HoD Chemical Engineering to design and discuss the scheme and syllabus of B.Tech. (Chemical Engineering) VII and VIII Semester as per CBCS. Following members were present in the meeting :

1. Prof. S. N. Saha (HoD Chemical Engg. - cum- **Chairman**, BOS)
2. Dr. A. K. Chandrakar (**Member** BOS, Asst. Prof., Dept. of Chemical Engg.)
3. Mr. Neeraj Chandraker (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
4. Mr. Amit Jain (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
5. Mrs. A. N. Joshi (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
6. Mr. G. P. Dewangan (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
7. Mr. V. P. Yadav (Invited Member, Asst. Prof., Dept. of Chemical Engg.)

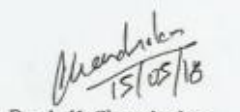
In this meeting, above mentioned members discussed and proposed the scheme and syllabus of B. Tech. (Chemical Engineering) VII and VIII semester as per CBCS as enclosed 20 pages duly signed by the chairman, member and invited members of the BOS.

By inadvertent mistake subject names of the Practical Courses of VI semester of course codes CH6PPC06 and CH6PPC07 were not mentioned, these subject names are Mass Transfer-II Lab and Process Dynamics and Control Lab, respectively.

Since the member Prof. Chandan Guha (Department of Chemical Engineering, Jadavpur University, Kolkata) could not attend this meeting due to his pre-occupation, as per his suggestion on telephonic conferencing with the members, this scheme and syllabus is being sent to the external BOS member Prof. C. Guha, for his review and formal consent as on today (15th May 2018).


15/5/18

Prof. S. N. Saha
Chairman, BOS
HOD, Chemical Engg.


15/05/18

Dr. A. K. Chandrakar
Member, BOS
Asst. Prof., Chem. Engg.


15.05.18

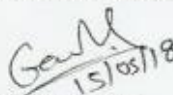
Mr. Neeraj Chandraker
Invited Member, BOS
Asst. Prof., Chem. Engg.


15/5/18

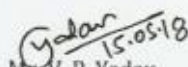
Mr. Amit Jain
Invited Member, BOS
Asst. Prof., Chem. Engg.


15/05/18

Mrs. A. N. Joshi
Invited Member, BOS
Asst. Prof., Chem. Engg.


15/05/18

Mr. G. P. Dewangan
Invited Member, BOS
Asst. Prof., Chem. Engg.


15.05.18

Mr. V. P. Yadav
Invited Member, BOS
Asst. Prof., Chem. Engg.



The following courses were revised in the of B. Tech. Final year (VII and VIII Semesters) :

- ❖ New Separation Processes (CH7TPC15)
- ❖ Petroleum Refinery Engineering (CH7TPE41)
- ❖ Project Engineering, Economics & Management (CH8TPC17)
- ❖ Petrochemical Technology (CH8TPE51)
- ❖ Optimization Techniques (CH8TOE41)

The following new courses were introduced in the of B. Tech. Final year (VII and VIII Semesters):

- ❖ Process Equipment Design-II (CH7TPC13)
- ❖ Design and Development of Catalyst (CH7TPE43)
- ❖ Membrane Separation Processes (CH8TPE53)
- ❖ Water Conservation and Management (CH7TOE32)
- ❖ Process Modeling & Simulation (CH8TOE42)
- ❖ Renewable Energy (CH8TOE43)

विभागाध्यक्ष, रासायनिक अभियांत्रिकी
HoD, Chemical Engineering
प्रौद्योगिकी संस्थान/Institute of Technology
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD



Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2018-19

School : School of Studies of Engineering and Technology

Department : Chemical Engineering

Date and Time : 11 September, 2019 - 11:30 AM

Venue : HoD room

Minutes of Meeting

The scheduled meeting of members of Board of Studies (BOS) was held today (11th September 2018) in the office of Prof. S. N. Saha, Chemical Engineering Department to discuss mainly the VRET 2018 Syllabi, new scheme and syllabi of B.Tech. (Chemical Engineering) I and II Semester. Following members were present in the meeting :

1. Prof. S. N. Saha (Member BOS, Dept. of Chemical Engg.)
2. Dr. A. K. Chandrakar (HoD I/c, Chemical Engg. - cum- Chairman, BOS)
3. Mr. Amit Jain (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
4. Mrs. A. N. Joshi (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
5. Mr. G. P. Dewangan (Invited Member, Asst. Prof., Dept. of Chemical Engg.)
6. Mr. Saurabh Meshram (Invited Member, Asst. Prof., Dept. of Chemical Engg.)

The scheme and syllabi of B. Tech. (Chemical Engineering) I and II semester already approved by the due committee on 31st July 2018 have been vetted and approved by the BOS Chemical Engineering committee.

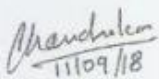
The committee has discussed and resolved to approve the syllabi of Vishwavidyalaya Research Entrance Test- 2018 (VRET-2018) for Paper-I (Research Methodology) and Paper-II (Chemical Engineering).


In this meeting, above mentioned members discussed and proposed the scheme and syllabus of B. Tech. (Chemical Engineering) I and II semester as per CBCS as enclosed 20 pages duly signed by the chairman, member and invited members of the BOS.


The members have opined and resolved that in the M.Tech. I semester scheme and syllabi Fluidization Engineering subject (Course No. CHPG1103) be read as Advanced Fluidization Engineering.

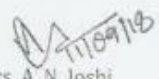
The matter related to appointment of examiners appears to be too early to recommend presently. At the time of getting the issue matured enough, the policy decision to be taken by the competent body will be deemed to be approved by BOS.

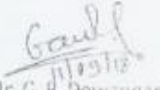
Since the external BOS member Prof. Chandan Guha from Kolkata could not attend this meeting due to his pre-occupation, as per his suggestion on telephonic conferencing with the members, this scheme and syllabus is being sent to him for his review and formal consent.

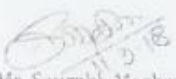

11/09/18
Dr. A. K. Chandrakar
Chairman, BOS
HOD (I/c), Chemical Engg.


11/9/18
Prof. S. N. Saha
Member, BOS
Professor, Chemical Engg.


11-9-18
Mr. Amit Jain
Invited Member, BOS
Asst. Prof., Chem. Engg.


11/09/18
Mrs. A. N. Joshi
Invited Member, BOS
Asst. Prof., Chem. Engg.


11/09/18
Mr. G. P. Dewangan
Invited Member, BOS
Asst. Prof., Chem. Engg.


11/9/18
Mr. Saurabh Meshram
Invited Member, BOS
Asst. Prof., Chem. Engg.



The following courses were revised in the of B. Tech. Final year (VII and VIII Semesters) :

- ❖ Physics (CH01TBS01)
- ❖ Basic Electrical Engineering (CH01TES01)
- ❖ Mathematics-I (CH01TBS02)
- ❖ Environmental Studies (CH01TMC01)
- ❖ Physics Lab (CH01PBS01)
- ❖ Basic Electrical Engineering Lab (CH01PES01)
- ❖ Engineering Graphics & Design Lab (CH01PES02)
- ❖ Mathematics-II (CH02TBS03)
- ❖ Chemistry (CH02TBS04)
- ❖ Thermodynamics (CH02TES03)

The following new courses were introduced in the of B. Tech. Final year (VII and VIII Semesters):

- ❖ English (CH01THS01)
- ❖ Induction Training Programme (CH01PMC01)
- ❖ Programming For Problem Solving (CH02TES02)
- ❖ Programming For Problem Solving Lab (CH02PES03)

विभागाध्यक्ष, रासायनिक अभियांत्रिकी
HoD, Chemical Engineering
प्रौद्योगिकी संस्थान/Institute of Technology
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD



Scheme and Syllabus

**DEPARTMENT OF CHEMICAL ENGINEERING
INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)**

**SCHEME FOR EXAMINATION
B.Tech. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING
FOURTH YEAR, SEVENTH SEMESTER**

S. No.	Course No.	Subject	Periods			Evaluation Scheme					Credits
			L	T	P	Sessional			ESE	Sub Total	
						IA	MSE	Total			
01.	CH7TPC13	Process Equipment Design- II new course	1	-	-	20	20	40	60	100	4
02.	CH7TPC14	Chemical Reaction Engineering-II	3	1	-	20	20	40	60	100	4
03.	CH7TPC15	New Separation Processes	3	1	-	20	20	40	60	100	4
04.	CH7TPE4X		3	1	-	20	20	40	60	100	4
05.	CH7TOE3X		3	1	-	20	20	40	60	100	4
PRACTICAL											
01.	CH7PPC08	Minor Project	-	-	6	30	-	30	20	50	3
02.	CH7PPC09	Vocational Training Viva Cum Seminar	-	-	3	50	-	50	-	50	2
TOTAL			15	5	9					600	25

IA – Internal Assessment MSE – Mid Semester Examination ESE - End Semester Examination
Total Marks – 600 Total Periods - 29 - Total Credits - 25

BOS held on 15th May 2018

Grand 15/05/18 *Chandhan* 15/05/18 *[Signature]* 15/05/18 *[Signature]* 15/05/18 *[Signature]* 15/05/18 *[Signature]* 15/05/18 *[Signature]* 15/05/18



DEPARTMENT OF CHEMICAL ENGINEERING
INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)

B.Tech. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING

FOURTH YEAR, EIGHTH SEMESTER

S. No.	Course No.	Subject	Periods			Evaluation Scheme					Credits
			L	T	P	Sessional			ESE	Sub Total	
						IA	MSE	Total			
01.	CH8TPC16	Process Equipment Design- III	3	1	-	20	20	40	60	100	4
02.	CH8TPC17	Project Engineering, Economics & Management	3	1	-	20	20	40	60	100	4
04.	CH8TPE5X		3	1	-	20	20	40	60	100	4
06.	CH8TOE4X		3	1	-	20	20	40	60	100	4
PRACTICAL											
01.	CH8PPC10	Project	-	-	8	60	-	60	40	100	4
TOTAL			12	4	8					500	20

IA - Internal Assessment

Total Marks - 500

MSE - Mid Semester Examination

Total Periods - 24

ESE - End Semester Examination

Total Credits - 20

BOS held on 15th May 2018

Grand
15/05/18

Chandrika
15/05/18

M
15/05/18

K
15/05/18

Chalau
15.5.18

Ajani
15/5/18

Sabha
15/5/18

DEPARTMENT OF CHEMICAL ENGINEERING
INSTITUTE OF TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
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LIST OF PROFESSIONAL ELECTIVES OFFERED BY DEPARTMENT OF CHEMICAL ENGINEERING
FOR VII and VIII SEMESTER

Semester	Subject Code (PE)	Subject
VII	CH7TPE41	Petroleum Refinery Engineering
	CH7TPE42	Polymer Technology - I
	CH7TPE43	Design and Development of Catalyst New Course
VIII	CH8TPE51	Petrochemical Technology
	CH8TPE52	Polymer Technology - II
	CH8TPE53	Membrane Separation Processes New Course

PE - Professional Elective

Grand
15/05/18

Chandrika
15/05/18

M
15/05/18

K
15/05/18

Chalau
15.5.18

Ajani
15/5/18

Sabha
15/5/18

BOS held on 15th May 2018



DEPARTMENT OF CHEMICAL ENGINEERING
INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)

LIST OF OPEN ELECTIVES OFFERED FOR VII and VIII SEMESTER

Semester	Subject Code (OE)	Subject
VII	CH7TOE31	Transport Phenomena
	CH7TOE32	Water Conservation and Management New Course
VIII	CH8TOE41	Optimization Techniques
	CH8TOE42	Process Modeling & Simulation New Course
	CH8TOE43	Renewable Energy New Course

OE- Open Elective

Note: In addition to the open elective courses, as prescribed above, the students are free to opt for any other subject of same credit from inter/intra school duly approved by the Board of Studies of the respective departments.

Grandh
15/05/18

Chandrasen
15/05/18

M
15/05/18

K
15/05/18

Godant
15/5/18

Ajmer
15/5/18

Sudha
15/5/18

BOS held on 15th May 2018



B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

20% Change

CH7TPC15 : New Separation Processes (3 1 0)

Unit I : Overview of Separation Processes: Basic Concepts of Separation Processes, Physico-Chemical Properties and Other Factors Controlling Separation, Limitations of Conventional Separation Processes and New Separation Processes, Equilibrium and Rate Governed Separation Processes and their Characteristics.

Unit II : Membrane Based Separation Processes: Principle of Membrane Separations Process, Advantages and Disadvantages, Classification, Membrane Materials, General Methods of Preparation and Characterization of Membranes, Membrane Modules, Concentration Polarization.

Unit III : Porous Membrane Based Processes: Reverse Osmosis, Ultrafiltration, Microfiltration, Nano-filtration, Dialysis, Ion-Selective Membranes and Electro-dialysis, Industrial Applications of Porous Membrane Based Processes.

Unit IV : Non-Porous Membrane Based Processes: Gas separation, Pervaporation, Liquid Membranes and their Industrial Applications, Medical Applications of Membranes, Miscellaneous Membrane Processes, Membrane Distillation, Membrane Reactors.

Unit V : Other Non-Conventional Separation Processes: Foam and Bubble Fractionation, Pressure and Temperature Swing Adsorption, Cloud Point Extraction, Centrifugal Separation Processes, Super Critical Fluid Extraction.

Text Books :

1. Separation Process Principles by J D Seader and E J Henley John Wiley & Sons, Inc.
2. Separation Processes by C J King, McGraw-Hill, Inc.
3. Membrane Separation Processes by K. Nath, PHI, New Delhi.
4. Membrane Technology and Applications by R W Baker, John Wiley and Sons, Ltd, UK.
5. Handbook of Industrial Membrane Technology by M.C. Porter, Crest Publishing House.

Handwritten signatures and dates: Gaehl 15/05/18, Chandan 15/05/18, Amani 15/05/18, and others.

BOS held on 15th May 2018



B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

CH7TPE41: Petroleum Refinery Engineering (310)

20% Change

Unit I : Petroleum Crude and Refining : Origin, Formation & Occurrence of Petroleum Crude, Exploration, Drilling and Processing, Reserve and Deposit of World, Indian Petroleum Refinery, Compositions, Classification & Physical Properties of Petroleum Crude.

Unit II : Physical Properties and Testing Methods of Petroleum Products : Evaluation of Petroleum, Physico-Chemical Properties of Various Petroleum Products as Per API / ASTM / BIS Specifications.

Unit III : Crude Processing : Pre-Treatment of Crude, Heating Techniques of Crude, Types of Distillation Columns & their Efficiencies, Atmospheric and Vacuum Distillation of Crude, Blending of Gasoline.

Unit IV : Chemical Treatment & Refining Operation : Chemical Treatment of Petroleum Products, Caustic Soda Treatment, Treatment With H_2SO_4 & H_2 , Mercaptan Removal & Oxidation Process, Sulphur-Removal From Petroleum Products – Doctor's Treatment, Hydro De-Sulphurization, Dewaxing and Refining of Lubricating Oils.

Unit V : Cracking & Reforming Operation : Visbreaking, Thermal Cracking, Catalytic Cracking, Hydrocracking, Catalytic Reforming, Alkylation, Isomerization and Polymerization, Naphtha Cracking, Delayed Coking & Fluidized Coking.

Text Books :

1. Petroleum Refinery Engineering by W.L. Nelson
2. Petroleum Refining by Gary and Handwarke, Marcel Dekker
3. Petroleum Refining & Petrochemicals by N.K. Sinha, Umesh Publications New Delhi.
4. Petroleum Refining Technology by I.D. Mall, CBS Publishers & Distributors Pvt. Ltd. New Delhi.

Gandhi
15/05/18

Alankar
15/05/18

W
15/05/18

M
15/05/18

Sharma
15/05/18

Yadav
15/05/18

Chakrabarti
15/05/18

BOS held on 15th May 2018



B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

60% Change

CH8TPC17: Project Engineering, Economics & Management (3 1 0)

Unit I : Nature and Importance of Project and Project Engineering : Concept of Project and Project Management, Characteristics of Project, Introduction to Project Engineering, Role of a Project Leader, General Design Considerations, Plant Layout and Site Selection, Flow Diagram, Concept of Scale Up, Concepts of Techno-Economic Feasibility Report.

Unit II : Technical and Financial Analysis : Technical Analysis, Financial Analysis, Significance of Financial Analysis, Elementary Knowledge of Book of accounts- Journal, Ledger, Balance sheet, Profit and Loss Account. Cost Estimation, Cash Flow Investment, Production Cost, Capital Investment, Cost Indices, Production and Overhead Cost, Interest and Taxes.

Unit III : Project Financing and Value Engineering : Meaning and Importance of Project Finance, Means of Finance and Sources of Project in India, Financial Institution Structure and Financial Assistance, Norms of Finance and Term Loan Procedure, Value Engineering - Function, Aims and Procedure.

Unit IV : Capital Expenditure, Profitability & Alternative Investments : Importance and Kinds of Capital Expenditure Decision, Capital Budgeting Process, Criteria of Capital Budgeting, Depreciation and its Calculation Methods, Methods of calculating profitability, Alternative investments, Break Even Analysis.

Unit V : Network Techniques for Project Management : Introduction, Development of Project Network, Network Scheduling, Critical Path Method, Program Evaluation & Review Technique, Planning and Scheduling of Activity Networks, Time Analysis, Gantt Chart.

Text Books :

1. Plant Design & Economics for chemical Engineers by M.S. Peters & K. D. Timmerhaus.
2. Projects: Planning, Analysis, Selection, Financing, Implementation and Review by Prasanna Chandra.
3. Project Engineering of Process Plants by H. F. Rase
4. Pilot Plants and Models and Scale up Methods in Chemical Engineering by R. E. Johnston.

Handwritten signatures and dates:
Gandhi 15/05/18
Chandra 15/05/18
Sinha 15/5/18
Sinha 15/5/18
Gandhi 15/5/18
12 15/05/18

BOS held on 15th May 2018



B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

30% Change

CH8TPE51: Petrochemical Technology (3 1 0)

Unit I : Survey of Petrochemical Industries : Petrochemical Industries in India, Plastic and Synthetic Fiber Industries, Product of Petroleum Industries, Feed Stocks for Petrochemical Production, Purification and Separation of Feed Stocks, **Chemicals from Methane.**

Unit II : Chemicals From C₂ Hydrocarbons : Chemicals from Ethane, Ethylene and Acetylene, Naphtha Cracking and Reforming, Hydrogen from Reforming of Hydrocarbons.

Unit III : Chemicals From C₃, C₄ and Higher Fractions : Chemicals from Propane, Propylene, Butanes, Butylene etc. Production of Synthesis Gases from Higher Fractions. Carbon Compound, Dehydrogenation of Hydrocarbon and Higher Paraffins.

Unit IV : Polymers of Olefins : Polymers and their Properties, Polymers from Olefins- Polyethylene (HDPE, LDPE), Polypropylene, Vinyl Polymers. Production of BTX, Benzene Derivatives, Products from Toluene, Oxidation Products of Toluene, Synthetic Fibers and their Production.

Unit V : Synthetic Rubber, Plastics and Detergents : Synthetic Rubber and its Production, Classifications of Plastics, Different types of Resin and their Production, ABS Plastics, Poly Carbonates (PC), Poly Urethanes, Polyamides, Polystyrene, Synthetic Detergents and their Production, **Petroleum Coke and Carbon Black.**

Text Books :

1. Modern Petroleum Technology by G.D. Hobson and W Pow.
2. A Textbook on Petrochemical Technology by Bhaskara Rao.

Gawli
15/05/18

Chandela
15/05/18

15/05/18

Ajani
15/5/18
Galan
15/5/18

15/05/18

Sidha
15/5/18

BOS held on 15th May 2018



B. Tech. Syllabus (CBCS)

Department of Chemical Engineering

20% Change

CH8TOE41 : Optimization Techniques (3 1 0)

System Analysis and Modeling : Introduction to Systems Analysis and Modeling with Reference to Chemical Engineering Problems, Differential Method for Solving One and Two Variable Problems With and Without Constraints, Case Studies, Application of Langrangian Multiplier Method.

Search Methods: One Dimensional Search Method- Newton's Method, Quasi Newton's Method, Polynomial Approximation Methods, Sequential Search Methods - Golden Section Method, Dichotomous Search Method, Interval Halving Method, Fibonacci Method.

Linear Programming: Modeling, Graphical Method, Single Phase Simplex Method, Two Phase Simplex Method, Duality, Dual Simplex Method.

Geometric Programming: As Applied to Chemical Engineering Problems with Degree of Difficulty Equal to Zero and One, with and without Constraints.

Dynamic Programming: Introduction to Dynamic Programming as Applied to Discrete Multistage Problems Like Cascade of CSTR, Train of Heat Exchanger etc., Computer Programming Techniques applied to Optimization.

Methods for Global Optimization.

Text Books :

1. Optimization Theory and Practice by Beveridge and Schechter
2. Optimization Techniques for chemical Engineers by Asghar Hussain
3. Optimization by S.S. Rao
4. Linear Programming by Hadley

Handwritten signatures and dates:
Gandhi 15/05/18
Mishra 15/05/18
Mishra 15/05/18
Sudhakar 15/05/18
Alani 15/05/18
Gola 15/05/18
K. 15/05/18

BOS held on 15th May 2018



20% Change

Subject code	L	T	P	Credit
CH01TES01/BASIC ELECTRICAL ENGINEERING	3	1	0	4

1. Elements in an Electrical circuit: R, L, C, Diode, voltage and current sources [3L + 1T]
2. DC circuits, KCL, KVL, Network theorems, Mesh and nodal analysis [6L + 2T]
3. Step response in RL, RC, RLC circuits [3L+1T]
4. Phasor analysis of AC circuits [6L+2T]
5. Single-phase and 3-phase circuits. (3L+1T)
6. Two port networks, BJT, CE and small signal model, operational amplifiers, model and applications. (3L+1T)
7. Introduction to digital circuits (6L+2T)
8. Transformers: modelling and analysis. (6L+2T)
9. Energy in magnetic field. (3L+1T)
10. Electromechanical energy conversion: principles and examples (3L+1T)
11. Principles of measurement of voltage, current and power (3L+1T)

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31/9/18

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2/10/18

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21/9/18

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11/09/18

[Signature]
11/9/18

[Signature]
11/09/18

[Signature]
11/9/18



Subject code	L	T	P	Credit
CH01TBS02/ MATHEMATICS-I	3	1	0	4

70% Change

Basic concepts of linear algebra and vector calculus.

1. **Linear Algebra:** Matrices, Vectors, Determinants, Linear Systems (12L + 4T)

Matrices, Vectors: Addition and Scalar Multiplication, Matrix Multiplication, Linear Systems of Equations, Gauss Elimination, Linear Independence, Rank of a Matrix, Vector Space, Solutions of Linear Systems: Existence, Uniqueness, Determinants, Cramer's Rule, Inverse of a Matrix, Gauss-Jordan Elimination.

2. **Linear Algebra:** Matrix Eigen value Problems (9L + 3T)

Eigen values, Eigenvectors, Applications of Eigen value Problems, Symmetric, Skew-Symmetric, and Orthogonal Matrices. Asymptotes: definition, properties and problems.

3. **Vector Differential Calculus.** Grad, Div, Curl (12L + 4T)

Vectors in 2-Space and 3-Space, Inner Product (Dot Product), Vector Product (Cross Product), Vector and Scalar Functions and Fields, Derivatives, Curves, Arc Length, Curvature, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

4. **Integral Calculus. Integral Theorems** (12L + 4T)

Line Integrals, Path Independence of Line Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals.

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CODE/SUBJECT	L	T	P	CREDIT
CH01TMC01/ENVIRONMENTAL SCIENCES	3	0	0	0

ENVIRONMENTAL STUDIES 90% Change

GR-4 NC 04 class
Bhawan

Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems: Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Natural Resources Renewable and Non-renewable Resources: Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India;

Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value. Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Environmental Policies & Practices. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, human wildlife conflicts in Indian context. Human Communities and the Environment, Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements Chipko, silent valley, Bishnois of Rajasthan. Environmental ethics: role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Field work: Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river etc.

Suggested Readings:

1. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
2. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.
3. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
4. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
CH01PBS01/PHYSICS LAB	0	0	3	1.5

5% Change

List of Experiments:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colors of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of lines per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the Energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by Thomson's method
11. To study the P-N junction diode characteristics, in forward and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.





SUBJECT CODE/NAME	L	T	P	Credit
CH01PES01/ BASIC ELECTRICAL ENGINEERING LAB	0	0	2	1

80% Change

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments-voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
- Sinusoidal steady state response of R-L, and R-C circuits-impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shaped due to B-H curve non-linearity should be shown along with a discussion about harmonics). Loading of a transformer; measurement of primary and secondary voltages and currents, and power.
- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-voltage, phase-to-neutral voltage, line and phase currents).
- Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.
- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
- Demonstration of (a) dc-dc converters (b) dc-ac converters-PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
CH01PES02/ENGINEERING GRAPHICS & DESIGN LAB	1	0	3	2.5

80% Change

ENGINEERING GRAPHICS & DESIGN

UNIT-I

Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales - Plain, Diagonal and Vernier Scales.

UNIT-II

Orthographic Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

Projections of Regular Solids

Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.

UNIT-III

Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone-Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic view of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT-IV

Isometric Projections covering,

Principles of Isometric projection-Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT-V

Overview of Computer Graphics

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids].

Suggested Text/Reference Books:

- (i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
- (ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
- (iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
- (iv) Narayana, K.L. & P Kanniah (2008), Text book on Engineering Drawing, Scitech Publishers
- (v) (Corresponding set of) CAD Software Theory and User Manuals

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SUBJECT CODE	L	T	P	Credit
CH02TBS03/ MATHEMATICS-II	3	1	0	4

95% Change

1. Transforms [6L + 2T]

Laplace Transforms, Fourier Series and Transforms

2. First-Order ODEs [9L + 3T]

Basic Concepts, Solutions of Separable ODEs, Exact ODEs, Linear ODEs, Solving ODEs by Laplace Transforms

3. Second-Order Linear ODEs [9L + 3T]

Homogeneous Linear ODEs of Second Order, Euler-Cauchy Equations, Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters

4. Series Solutions of ODEs, Special Functions [12L + 4T]

Power Series Method, Legendre's Equation, Legendre Polynomials, Bessel's Equation, Bessel Functions, Sturm-Liouville Problems, Orthogonal Functions

5. Partial Differential Equations (9L + 3T)

Basic Concepts, Classification, Solution of PDEs: Separation of Variables, Fourier Series, Laplace Transforms

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SUBJECT CODE/NAME	L	T	P	Credit
CH02TB504/CHEMISTRY	3	1	0	4

90% Change

Unit-I Concept of Quantum Energy and Spectroscopy: Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fiesher rules for calculating λ_{max} of conjugated dienes & α, β -unsaturated carbonyl compound, various shifts in λ_{max} and intensities. Infra Red Spectroscopy: Conditions for Infra Red Spectroscopy, Molecular vibrations & factors affecting Infra Red frequencies. [8 L]

Unit-II Chemical Bonding in Molecules: Introduction of chemical bonding, VSEPER Theory, V.B.Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions. [16 L]

Unit-III Concept of Chirality, Enantiomers, Diastereomers, Meso-compounds and Racemic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and Cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Center of symmetry, Absolute and Relative Configuration (R & S, D & L and E & Z). [8 L]

Unit-IV Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions. [12 L]

Unit-V Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction involving Addition, Elimination, Substitution and Ring opening and Cyclization. [16 L]

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SUBJECT CODE/	SUBJECT	L	T	P	Credit
CH02TE103/	THERMODYNAMICS	3	1	0	4

Objectives:

Principles and application of first and second law of thermodynamics, and phase equilibria.

Contents :

1. Introduction- scope of thermodynamics, Dimensions and Units, Temperature, Pressure, Work, Energy, Heat [3L + 1T]
2. Energy conservation & first law of thermodynamics; State functions; Equilibrium; Phase Rule; Reversible process; Constant P, V, T processes; Mass and energy balances for open systems . [6L + 2T]
3. Phases, phase transitions, PVT behavior; description of materials – Ideal gas law, van der Waals, virial and cubic equations of state; Reduced conditions & corresponding states theories; correlations in description of material properties and behavior [6L + 2T]
4. Heat effects-latent heat, sensible heat, standard heats of formation, reaction and combustion. [3L + 1T]
5. Statements of the second law; Heat engines, Carnot's theorem,; Thermodynamic Temperature Scales; Entropy; Entropy changes of an ideal gas; Mathematical statement of the second law; Entropy balance for open systems; Calculation of ideal work, Lost work. (6L + 2T)
6. Thermodynamic property of fluids, Maxwell relations, 2-phase systems, graphs and tables of thermodynamic properties. (6L + 2T)
7. Application of thermodynamics to flow processes-pumps, compressors and turbines (3L +1T)
8. Thermodynamic analysis of steam power plants; Rankine cycle; Internal combustion engine, Otto engine; Diesel engine; Jet engine. (6L + 2T)
9. The Carnot refrigerator; Vapor-compression cycle; Absorption refrigeration; Heat pump, Liquefaction processes. (6L + 2T)

Suggested Text Books

1.J.M. Smith, H.C. Van Ness and M.M. Abbott, Introduction to Chemical Engineering Thermodynamics, 7th edition, McGraw-Hill International Edition, 2005.

Suggested References Books

1.M J Moran, H N Shapiro, D D Boettner and M B Bailey, Principles of Engineering

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