।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

25 1994 - 2019 SILVER JUBILEE YEAR

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील प्रथम वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहेत.

1. Agricultural Microbiology
2. Agrochemicals & Fertilizers
3. Analytical Chemistry
4. B.C.A.
5. B.Voc. (Food Processing, Preservation and Storage)
6. B.Voc. (Web Printing Technology)
7. Biochemistry
8. Bioinformatics
9. Biophysics
10. Biotechnology (Vocational)
11. Biotechonology
12. Botany
13. Chemistry
14. Computer Application (Optional)
15. Computer Science (Optional)
16. Computer Science
17. Dairy Science
18. Dyes and Drugs
19. Electronics
20. Environmental Science
21. Fishery Science
22. Food Science
23. Geology
24. Horticulture
25. Industrial Chemistry
26. Information Technology (Optional)
27. Mathematics
28. Microbiology
29. Network Technology
30. Physics
31. Software Engineering
32. Statistics
33. Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–०१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०१९–२०/**२९२**

दिनांक : ०३.०७.२०१९.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded.

Faculty of Science

SYLLABUS

B.Sc. First Year (Industrial Chemistry)

Semester-I &II

CBCS

In force from June – 2019

Distribution of credits for B.Sc. Industrial Chemistry (optional)

Under Faculty of Science

B.Sc. Syllabus structure

Semester Pattern effective from June - 2019

Subject: Industrial Chemistry

B.Sc. First Year (Semester-I&II)

Total credits semester I and II: 12

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
I	CCIC I (Section-A)	Fluid Mechanics & Unit Operation P-I	03	45	10	40	50	2
	CCIC I (Section-B)	(Material Balance & Process Calculations P-II	03	45	10	40	50	2
II	CCIC II (Section - A)	(Heat Transfer & Aspects of Industrial Chemistry) P-III	03	45	10	40	50	2
	CCIC II (Section -B)	(Energy Balances & Process Calculations) P-IV	03	45	10	40	50	2
	CCICP-I (CCIC- I&II), (section A&B)	Practical's based on Section A & Section B of(CCIC-I&II) P-V	04	20 Practical's	20	80	100	4
						Total credits semester I and II:		**12**

Note:

- **The syllabus is based on six (3x2) theory periods and four practical periods per batch per week.**
- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10fromSection B.**

B. Sc. Second Year (Semester III&IV)

Total credits semester III and IV:12(4*)

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
III	CCIC III (Section A)	Unit Operation-III Paper - VI	03	45	10	40	50	2
	CCIC III (Section B)	Chemical Reaction Engineering. (P-VII)	03	45	10	40	50	2
	CCICP-II(CCIC-III& IV) (section A)	Practical's based on P-VI&P-VIII(P-X)	04	20 Practical's	10	40	50	2
	CCICP-II(CCIC-III&IV), (section A)	SEC I (1Skill/Optional)			**15x3=45**			**(02)***
IV	CCIC IV (Section A)	Unit Operation-IV (P-VIII)	03	45	10	40	50	2
	CCIC IV (Section B)	Pollution monitoring and Control (P-IX)	03	45	10	40	50	2
	CCICP-III(CCIC-III&IV), (section B)	Practical's based on P-VII and P-IX (P-XI)	04	20 Practical's	10	40	50	2
	CCICP-III (CCIC-III & IV), (section B)	SEC II (1Skill/Optional)			**15x3=45**			**(02)***
Total credits semester III and IV:								**12(4)***

Note:

- **The syllabus is based on six(3x2) theory periods and four practical periods per batch per week.**
- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10 from Section B.**

B. Sc. Third Year (Semester V&VI)

Total credits semester V and VI:12

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
V	DECIC I [(Section A)Elective]	Unit Process in Organic Synthesis (P-XII) **OR** Chemical Engineering Thermodynamics	03	45	10	40	50	2
	DECIC I (Section B)	Process equipment design and process Instrumentation -(P-XIII)	03	45	10	40	50	2
	DECICP-I (DECIC-I& II) (section A)	Practical's based on P-XII&P-XIV (P-XVI)	04	20 Practical's	10	40	50	2
	DECICP-II (DECIC-I & II) (section A)	SEC II (1Skill/Optional)			**15x3=45**			**(02)***
VI	DECIC II (Section A) (Elective)	Unit Process in Inorganic Synthesis Drug Dyes and Industrial Safety (P-XIV) OR Introduction to Drug Design (P-XIV)	03	45	10	40	50	2
	DECIC II (Section-B)	Spectroscopy & chromatography, Plant Utilities (P- XV)	03	45	10	40	50	2
	(DECIC-I& II) (section B)	Practical's based on P-XIII&P-XV (P-XVI)	04	20 Practical's	10	40	50	2
	DECICP-IV (section B)	SEC IV (Project Work)			**50**		**50**	**(02)***
						Total credits semester V and VI:		**12(4)***

Note:

- **The syllabus is based on six(3x2) theory periods and four practical periods per batch per week.**
- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10 from Section B.**

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-I)

Semester Pattern effectivefrom-2019

Industrial Chemistry

CCIC-I (Section-A)

Fluid Mechanics & Unit Operation

(P-I)

Credits:02

Marks:60 **Periods:45**

UNIT-I

Fluid Mechanics-I: **10P**

1.1 Flow of Fluids: Definitions of fluids, Classification of fluids, Properties of fluids, Fluid Pressure, Pressure Head, Hydrostatic equilibrium for compressible and incompressible fluids.

1.2 Application of fluid statics: Manometers, U-tube manometer, Inclined Manometer, Differential Manometer, Continuous gravity decanter and Numerical on Unit first

Unit-II

Fluid Mechanics-II: **10P**

2.1. Fluid Flow Phenomena: Types of flow, Laminar flow, , Turbulence-Reynolds number & Transition from Laminar to Turbulent flow, Reynolds experiment, Boundary layers, Flow in boundary layers, Laminar and Turbulent flow in boundary layers. and Numerical on Unit second

UNIT-III **10P**

3.1. Basic Equations of fluid flow: Equation of Continuity, Bernoulli's equation, Pump work in Bernoulli's equation and its application**.** and Numerical on Unit third

Unit-IV

4.1. Transportation and Metering of fluids: **15P**

Transportation of fluids: Pipe, Tubing, Fittings & valves. Pumps: Classification of Pump, Developed head, Power requirement, Suction lift and cavitations, Positive- displacement pumps, Reciprocating pumps, Rotary pumps, Centrifugal pumps, Centrifugal pump theory, Ideal pump, Actual pump performance, Power consumption, Efficiency. Air Binding and Pump Priming, Losses in Centrifugal Pump, Metering of fluids: Full bore meters- Principle, Construction and Working, Advantages and Disadvantages of Venturimeter , Orifice meter , Pitot Tube, Rotameter. Numerical on Unit fourth

Refferance Book:

1) Unit Operation I by K.A.Gavhane.

2) Unit Operation I by Mc Cabe Smith.

Objective	To acquire basic knowledge of flow of fluids, their applications ,Phenomenon and basic equations in fluid mechanics
Course Outcome(s)	
CO1	• The students understood about classification & properties of fluids
CO2	• The students acquire knowledge of application of different types of Manometers.
CO3	• CO3:The students known about different types of flow of fluids
CO4	• The students known about different types of flow of fluids
CO5	• The students are knowing the different types of accessories used for pipe fittings, classification of pumps, Rotameter and their applications

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-I)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCICI (Section-B)

(Material Balance & Process Calculations)

(P-II)

Marks:50 **Periods:45**

UNIT-I **08P**

1.1 Units and Dimensions: Introduction, Dimensions & Systems of Units, Fundamental Quantities, Derived Quantities, Conversions & Problems.

UNIT -II **13P**

2.1 Basic Chemical Calculations: Introduction, Mole, Atomic Mass & Molar Mass, Equivalent Mass, Solids, Liquids & Solutions, Important Physical, Properties of Solutions, Gases & Problems

UNIT-III **12P**

3.1 Material balances without chemical reactions: Classification of Material Balance Problems, Material balances without chemical reactions, Outline of Procedure for Material Balance Calculations, Distillation, Evaporation, Absorption, Extraction, Drying, Filtration, Mixing, Crystallization and Problems on Material Balances.

UNIT -IV **12P**

2.2 Material Balances with Chemical Reactions: Stoichiometry, Stoichiometric Equations, Stoichiometric Coefficients, Stoichometric ratio, Limiting reactant, Excess reactant, Conversion, Yield and Selectivity and Problems on Material Balances with Chemical Reactions.

Objective	The students are expected to learn - Units& dimensions,BasicChemical Calculations,Material Balances without Chemical ReactionMaterial Balances with Chemical Reaction
Course Outcome(s)	
CO1	• CO1: The students are learned different units used in systems & its use
CO2	• CO2: The students can ex[lain mole concept, Atomic& Mass weight & physical properties of solid, liquid, & gases
CO3	• CO3: The students can solve the problems on Material Balances.
CO4	• CO1: Students understood the various forms of heat transfer.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC-II (Section-A)

(Heat Transfer & Aspects of Industrial Chemistry) (P-III)

UNIT I

Heat Transfer: **15P**

1.1 Conduction: Basic law of Conduction, Thermal conductivity, Compound resistances in series, Heat flow through a Cylinder and Numerical on Conduction

1.2. Convection: Classification of Convection. Numerical on Convection

1.3. Radiation: Absorptivity, Reflectivity and Transmissivity, Krichhoff's law, Laws of black body radiation, Steafan-Boltsmann law, Heat Transfer by radiation Radiation

Unit-II

2.1. Heat Exchange Equipments: **12P**

Single pass tubular condenser, Double pipe heat exchanger, Counter Current and Parallel flow, Energy Balances, Enthalpy balances in heat exchangers, Enthalpy balances in total condensers, Overall Heat Transfer Coefficients, LMTD, Individual Heat Transfer Coefficient, Calculation of Overall Coefficients from individual coefficients, fouling factors.

UNIT-III

Industrial Aspects of Chemistry: **10P**

3.1. Glass:

Introduction, physical & Chemical Properties of Glass, Characteristics, Raw Materials, Chemical Reactions, Methods of Manufacture of Glass & Uses.

Unit-IV

4.2. Cement: **08P**

Introduction, Composition, Types of Cement, Raw Materials, Manufacture of Cement by Wet & Dry Process, Reactions in the Kiln, Setting of Cement, Testing & Uses of Cement.

Reference Books:

1. Unit Operations of Chemical Engineering- McCabe Smith

2. Unit Operations-I (Fluid Flow & Mechanical Operations)- K. A. Gavhane

3. Unit Operations-II (Heat & Mass Transfer)- K. A. Gavhane

4. Heat Transfer- K. A. Gavhan

5. Principles of Heat Transfer & Mass Transfer- S. D. Dawande

6. Industrial Chemistry- B. K. Sharma.

Objective	The students are expected to learn –Conduction, Convection, Radiation ,Heat Exchange Equipments ,Glass, Cement
Course Outcome(s)	
CO1	• Students understood the various forms of heat transfer
CO2	• . They knows the various types of heat exchange equipments used in industries & the overall heat transfer coefficients.
CO3	• : The students knows physical & chemical properties of glass, ceramics, Cement & its applications

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC-II (Section-B)

(Energy Balances & Process Calculations)

P-IV

Marks:50 **Periods:45**

UNIT-I **20P**

1.1 Energy balances: Forms of Energy, Kinetic Energy, Potential Energy, Internal Energy, Heat, Work, General Energy Balance Procedure, Energy Balances on Closed Systems, Heat Capacity, Relation between Cp & Cv for an Ideal Gas, Empirical equation for Heat Capacities, Mean Molal Heat Capacities of Gases, Heat Capacities of gaseous mixture, Enthalpy Changes Accompanying Chemical Reactions, Heat of Reaction, Heat of Formation, Standard Heat of Formation, Heat of Combustion, Hess's law of Constant Heat Summation, standard Heat of reaction from heat of formation, Standard Heat of Reaction from Heats of Combustion, Effect of temperature on Heat of Reaction, Effect of Pressure on Heat of Reaction, Adiabatic Process, Adiabatic Reaction, Adiabatic Reaction Temperature, Phase Change Operation, Latent Heat of Vaporization, Latent Heat of Fusion, Latent Heat of Sublimation, Energy Balance during Phase Change Operation, Heat of solution and Heat of Mixing. (Numerical)

Unit-II **10P**

2.1 Recycle Operations: Fuels. recycling-meaning & purpose Recycle Stream, Recycle Operation –block diagram, Purging Operation, Recycle reactor with purge, Combined feed ratio, Recycle ratio, Purge ratio, Examples

UNIT-III **07P**

3.1 Fuels: Introduction, Calorific Value, Classification & Properties of Fuels.
Solid Fuels: Properties, Composition & Analysis of Coal.
Gaseous Fuels*:* Classification, Natural Gas, and LPG.
Liquid Fuels: Petroleum, Composition & Classification, Definition of Flash Point & Fire Point, Knocking, Octane Number, Aniline Point, Refining of Petroleum, Cracking, Thermal & Catalytic Cracking, Reforming, Thermal & Catalytic Reforming.

Unit-IV **08P**

4.1. Water Analysis: Chemical & Physical Examination of Water, Chemical Substances affecting potability, Colour, Turbidity, Odour, Taste, Temperature, pH, Conductivity, Suspended Solids, Acidity, Alkalinity, Free Chlorine, Calcium & Magnesium, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand.

Note: 60 % Weightage will be given to Problems.

Reference Books:

1. Chemical Process Principles- Hougen & Watson.
2. Stoichiometry- B. I. Bhatt & S. M. Vora.
3. Introduction to Process Calculations (Stoichiometry)- K. A. Gavhane.
4. Industrial Chemistry By B. K. Shara.

Objective	The students are expected to learn-Recycle Operations, Energy Balances,
Course Outcome(s)	
CO1	• CO1: Students are knowing recycle stream, ratio,& purging operations
CO2	• The students knows the various forms of energy, Heat capacity, Heat of formation & Heat of mixing
CO3	• The students can define solid, liquid & gaseous fuels & refining of Petroleum cracking
CO3	• . Also, knows chemical & physical examination of water.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC (I &II)(Section A&B)

(P-V)

Marks: 100 **Practical's: 20**

1. To Determine the Co-efficient of Venutrimeter.
2. To Determine the Co-efficient of Orifice meter.
3. To Study the Characteristics of Centrifugal Pump.
4. To Verify Hagen-Poisellue's Equation.
5. To Study the Pipe Fittings Test Rig.
6. To Study the Thermal Conductivity of Bad Conductor.
7. Determination of Acid Value of Lubricating oil.
8. Determination of Saponification Value of Lubricating oil.
9. Determination of Viscosity of Lubricant by Red Wood Viscometer.
10. Determination of Flash & Fire Point of Lubricating oil by
    a) Cleveland's Apparatus (Open Cup)
    b) Abel's Apparatus (Closed Cup)
    c) Pensky-Marten's Apparatus (Closed Cup).
11. Determination of hardness of water.
12. Determination of percentage of iron in cement (Volumetrically).
13. Determination of amount of available chlorine in Bleaching powder.
14. Estimation of calcium in limestone.
15. Determination of dissolved oxygen (DO),
16. Determination of chemical oxygen demand (COD) in given wastewater sample.
17. To measure the density of various liquids by pyknometer .
18. To Determine the Chloride Content of water by Mohr's Method.
19. Determination of NaOH & Na_2CO_3 in the given alkali mixture solution
20. Determination of Alkalinity of Water sample