SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

Ref:SU/BOS/Science/496 **Date: 02/09/2024**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

Subject: Regarding Minor Change syllabi of B.Sc. Part-III (Sem.V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/06/ Date: 01/01/2024 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change syllabi, nature of question paper of B.Sc. Part-III (Sem.V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-III (Sem. V & VI) as per NEP-2020 (1.0)	
1.	B.Sc Part III Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	5	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	6	I.T.Cell /Computer Centre
3	The Chairman, Respective Board of Studies	7	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	8	Affiliation Section (T.1) (T.2)
9	IQAC Cell		

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus for

B.Sc. Part-III Sugar Technology (Entire)

(Under Faculty of Science & Technology)

AS PER NEP– 2020

(To be implemented from Academic Year 2024 /– 25)

Program Structure

Choice Based Credit System (CBCS) with Multiple Entry & Exit (MEME)

Options as per NEP – 2020

To be implemented From the Academic Year 2024-25

Third Year Bachelor Science Sugar Technology (Entire) (Level – 5)

Programme structure (NEP- 2020 PATTERN)

Semester V & VI

S E M E S T E R – V (Duration – 6 Months)																		
Sr. No.	(Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME										
		THEORY			PRACTICAL			THEORY					PRACTICAL					
								Internal		University								
		Credits	No. of lecture	Hours	Credits	No. of lecture	Hours	Max Marks	Min Marks	Hours	Max	Min	Hours		Max		Min	
1	DSE - E	**2**	3	2.4				10	4	2	40	**14**	**PRACTICAL EXAMINATION IS ANNUAL**					
2	DSE	**2**	3	2.4				10	4	2	40	**14**						
3	DSE	**2**	3	2.4	**8**	**20**	**16**	10	4	2	40	**14**						
4	DSE	**2**	3	2.4				10	4	2	40	**14**						
5	DSE	**4**	4	3.2				10	4	2	40	**14**						
6	SEC - V	Any One From Pool of Course			**2**	------	------						**2**		**50**		**18**	
	Total	**12**	**16**	**12.8**	**10**	**20**	**16**	**50**			**200**							
S E M E S T E R – VI (Duration – 6 Months)																		
1	DSE	**2**	3	2.4				10	4	2	40	**14**	**As per BOS Guide-lines**		**200**		**70**	
2	DSE	**2**	3	2.4				10	4	2	40	**14**						
3	DSE	**2**	3	2.4	**8**	**20**	**16**	10	4	2	40	**14**						
4	DSE	**2**	3	2.4				10	4	2	40	**14**						
5	DSE	**4**	4	3.2				10	4	2	40	**14**						
6	SEC VI	Any One From Pool of Course			**2**	------	------						**2**		**50**		**18**	
	Total	**12**	**16**	**12.8**	**10**		**16**	**50**			**200**							
	GRAND TOTAL	**24**	**32**	**25.6**	**20**	**40**	**32**			**400**	**800**							

B.Sc. III Sugar technology Entire List of courses:

(Sem V & VI)

Course Code	Name of Course	Course Code	Name of Course
Sem V		**Sem VI**	
DSCST30	Capacity Calculation- I (Clarification House)	**DSCST35**	Allied Sugar Manufacturing
DSCST31	Capacity Calculation- II (Evaporation & Crystallization)	**DSCST36**	Allied Co Product Manufacturing
DSCST32	Process Instrumentation & Control	**DSCST37**	E1:Alcohol Technology: I E2:Water Management in Cogeneration : I
DSCST33	Advanced Sugar Technology	**DSCST38**	E1:Alcohol Technology: II E2:Water Management in Cogeneration : II
DSCST34	English – III	**DSCST39**	English – IV

Practical

DSCSTP 9	**Practical I** - Inplant Training Report
DSCSTP 10	**Practical II** - Research Project

B.Sc. Part III Sugar Technology Semester V

Syllabus for Capacity Calculation I (Clarification House) **– DSCST30**

Unit – 1 **[15]**

Capacity of weighing scale and reaction tank.

- Capacity of juice and imbibitions water weighing scale,
- Capacity of raw juice and imbibitions water pumps
- Capacity of reaction tank, calculation of retention time of juice in reaction tank. Calculation forso2 gas distribution system

Capacity of Equipment for process chemical

- Calculation of optimum dose of phosphoric acid.
- Capacity of lime preparation equipments with lime pumps.
- Capacity of sulphur burner and air compressor.

Unit – 2 **[15]**

Capacity of juice heater

- Calculation of Juice heater capacity
- Calculation of juice velocity in the juice heater.
- Calculation of number tubes and passes in the juice heater.
- Calculation of juice inlet/outlet pipe size. Calculation of steam/vapor pipe size. Calculation of condensate pipe size, calculation of non-condensable gases pipe size. Calculation of tube plate diameter.

Capacity of clarifier.

- Juice retention time in different type of clarifier
- Capacity of clarifier
- Capacity of clear juice pump, capacity of mud pump. Capacity of flash tank, Capacity of rotary vacuum filter.
- Capacity of syrup Sulphitor and syrup pumps.

Reference books:

1) Introduction of cane sugar technology by Jenkins
2) Unit operation of cane sugar production by Jon .H. Payne.
3) Manufacturing of sugar from cane sugar by G.M.Park.
4) Efficient management in sugar factory by Mangalsing
5) Cane sugar sugar manufacturing in India by D.P.Kulkarni.

B.Sc. Part III Sugar Technology Semester V

Syllabus for Capacity Calculation II (Evaporation & Crystallization house) DSCST31

Unit – 1 **[15]**

Capacity of Evaporator

- Co-efficient of heat transmit ion,
- Quantity of water evaporated,
- Properties of steam,
- Boiling point elevation.
- Heating surface of evaporator station.
- Calculation of individual Brix
- Calculation of vapor piping.
- Steam requirement without vapor bleeding, steam requirement with vapor bleeding to juice heater and pan.

Vacuum pan

- Optimum S/V ratio of different pan.
- Pan capacity by massecuite %cane method.
- Calculation of heating surface, and number of tubes.
- Pan capacity by solid balance method,
- Calculation of vapor pipe& condensate pipe size capacity of injection pump

Unit – 2 **[15]**

Centrifugals

- Capacity of cooling crystallizers, quantity of water required for cooling
- Capacity of centrifugal , Capacity of runoff pump.
- Capacity of melter and melt pump
- Capacity of final molasses weighing scale.
- Capacity of superheated wash water system.

Finishing operation

- Capacity of hopper, elevator and grader.
- Capacity of hot and cold air blower
- Capacity of sugar silo.
- Capacity of molasses storage tank,
- Capacity of sugar storage godown

Reference books:

1) Introduction of cane sugar technology by Jenkins
2) Unit operation of cane sugar production by Jon .H. Payne.
3) Manufacturing of sugar from cane sugar by G.M.Park.
4) Efficient management in sugar factory by Mangalsing
5) Cane sugar sugar manufacturing in India by D.P.Kulkarni.

B.Sc. Part III Sugar Technology Semester V

Syllabus for Process Instrumentation & Control – DSCST32

Unit – 1 **[15]**

a) Auto cane feed control system
Introduction, Need & scope, Classification, Functional elements, Calibration

b) Imbibitions water flow rate &temperature control system
Introduction, Need &scope, Classification, Functional elements, Calibration

c) Central lubricant control system
Introduction, Need &scope, Classification, Functional elements, Calibration

d) Mill drive section
Thyristor Controlled Variable speed D.C. Drives, Thruster Converter Station (Digital type**)**

e) DCS for boiler control
Introduction, need and scope, classification, level measuring instruments, flow measuring instruments, flow diagram

Unit – 2 **[15]**

a) Turbine section
DCS for turbine control, Introduction, need and scope, Flow diagram, Construction and working, Advantages.

b) Auto pan control system.
Introduction, Need & scope, Vacuum control system, Super saturation, control system, Feed control system, Flow diagram,Working

c) Auto feed control of centrifugal feed.
Introduction, Need &scope, Flow control, advantages,Working

d) Auto super heated wash system for centrifugal
Introduction, Need & scope, Temperature & pressure control, advantages, Working.

e) DCS System for centrifugal operation
Introduction, need and scope, Massecuite charging control, Screen & sugar wash control, Sugar discharging control, flow diagram

Reference Book:

1) Hand book of sugar engineering By- H. Eugot
2) Industrial automation –process control &instrumentation- By S. Medida
3) The complete book on sugar cane processing –chapter 24 By H-panda
4) Instrumentation & automation in sugar industries By-S.S. Engineering.
5) Instrumentation –Shivaji University By Anand M.S.
6) Industrial Instrumentation By H.K Sigh

B.Sc. Part III Sugar Technology Semester V

Syllabus for Advanced Sugar Technology – DSCST33

Unit - 1 **[15]**

a) screening of the juice

Effect of bagasillo on manufacturing process, its removal by DSM screen, rotary screen & two stage rotary screens, Advantage of rotary Screen

b) Juice stabilization & pH control system

On line mass flow meter for juice weighment, Auto pH control system for juice clarification,

c) New trends in clarification

New trend in juice clarification- filtrate and syrup clarification, Advantages of above both processes

d) S.R.T

Tray less clarifier or short retention time (S.R.T.) Clarifier, construction and working

e) Decanter

Muddy juice treatments, construction and working

f) Sulphur Burner

Film type sulphur burner, Instrumentation and automation for film type sulphur burner.

Unit – 2 **[15]**

a) Steam Economy

Vapor bleeding and steam economy, Basic requirement of steam, Steam requirement when vapor are used for entire juice heating, Steam requirement when vapor are used for juice heating and pan boiling, On line conductivity measurement of condensate water, Flashing of condensate, Different steam saving device used in sugar industries

b) Pan Automation

Pan boiling instrumentation and automation system for batch and continuous pan, Automatic Brix and temperature measurement of molasses conditioner, Automatic Brix and temperature measurement of melter

c) Centrifugal control

Auto feed control system for centrifugal, Wash water system for centrifugal,

Reference Books:

1) Hand book of sugar engineering By - H.Eugot
2) Hand book of cane sugar By - R.B.L. Mathur
3) Cane sugar engineering By-Peter Rein
4) Machinery and equipments of cane sugar factory- By Tromp.

B.Sc. Part III Sugar Technology Semester V

Syllabus for English III (Compulsory) – DSCST34

MODULE I

A. Interview Skills

B. Enterprise - Nissim Ezekiel

MODULE II

A. E-Communication

B. The Ant and the Grasshopper – W.S. Maugham

MODULE III

A. Englishfor Competitive Examinations

B. The Look-Out Man - Nicholas Bentley

MODULE IV

A. Forgetting Our Own History – SudhaMurty

B. (i) The Butterfly – ArunKolatkar

(ii) For Your Lanes, My Country --Faiz Ahmed Faiz

***Note: Semester V: 10 Marks for Internal Evaluation: STUDENTS' SEMINAR**

B.Sc. Part III Sugar Technology Semester VI

Syllabus for Allied Sugar Manufacturing – DSCST35

Unit – 1 **[15]**

a) Manufacturing of raw sugar
Clarification process, Crystallization process, Centrifugal process

b) Manufacturing of Jaggery & Jaggery powder
Extraction &clarification of juice, Concentration of juice to rab, Drying & packing of Jaggery, Crystallization process of Jaggery powder, Curing, Drying and packing of Jaggery powder

Unit – 2 **[15]**

a) Manufacturing of refine sugar
Types of refineries, Mingling and affination process, Clarification of refine melt Evaporation & crystallization, Specification of refine sugar

b) Manufacturing of Khandsari sugar
Specification of Khandsari sugar, Extraction &clarification of cane juice, Open pan boiling system, Purging, drying & packing system

Reference Books

1) Hand book of sugar refinery By chung chi chou
2) Manufacture &refining of raw sugar By-v.e.Baikow

B.Sc. Part III Sugar Technology Semester VI

Syllabus for Allied Sugar Co-Products – DSCST36

Unit – 1 **[15]**

a) Molasses

Composition of molasses, storage of molasses, Quality of molasses –pre clarification of molasses, Molasses for production of alcohol process, Molasses for production of yeast process, Molasses for production of acetone process, Molasses for production of glycerin process, Molasses for production of cattle feed process ,other use of molasses in different countries

b) Production of ethanol from cane juice

Unit – 2 **[15]**

a) Bagasse

Composition of bagasse, storage of bagasse, Separation of pith from bagasse, Production of pulp and paper from bagasse process, Production of particle board and fiber board from bagasse process, Production of corrugated boards and boxes from bagasse process, Production of furfural from bagasse process, Production of xylitol from bagasse process, Production of plastic from lignin in bagasse process, Production of methane & product gas from bagasse process, Production of cattle feed from bagasse process, Other use of bagasse and bagasse ash, Generation of surplus power from bagasse

b) Press mud (filter cake)

Composition of filter cake, Use of filter cake as fertilizer process, Use of filter cake for production of cane wax process, Use of filter cake for production of bio-gas process, Use of filter cake as fuel process, Use of filter cake as cattle feed process

Reference Books:

1) Ethanol & distillation by H.C. Barron
2) The book on sugarcane processing & by-products of molasses – H. Panda.
3) Process synthesis for fuel ethanol production - C.A. Cardona.
4) Kale U.M (1990) glance at distillery by-products DSTA 40th convention.

B.Sc. Part III Sugar Technology Semester VI

Elective

Syllabus for Water Management In Cogeneration I – DSCST37

Unit – 1 **[15]**

a) Water
Water properties &nature, Source of water, Uses of water &basic chemistry, Water related table

b) Treatments
Filtration, Clarification, Oxidation, Chlorination, De-aeration

c) Ion –exchange method
Softner, De-alkalization, Demineralization application &limitation, Resin

Uniit – 2 **[15]**

a) Membrane technology
Ultra filtration, Nano filtration, Reverse osmosis, Electro-dialysis

b) Boiler water treatments
Feed water treatment, Condensate treatment, Boiler water treatment, Boiler blow down, Reasons of boiler failures, Boiler preventive maintenance, tubes internal chemical cleaning, Boiler feed & boiler water treatments, Boiler water limits, Carryover& priming in boiler.

Reference Books:

1) Efficient management in sugar industries by Mangalsingh
2) Geo economical study of waste water management of sugar industries by-S. A.Manglekar
3) Gebetz hand book
4) Nalco water treatments
5) Albtros hand books
6) Appa Awha hand book

B.Sc. Part III Sugar Technology Semester VI

Elective

Syllabus for Water Management In Cogeneration II – DSCST38

Unit – 1 **[15]**

a) Cooling tower &cooling water treatments
Need of cooling tower, Classification of cooling tower,Cooling tower maintenance, Cooling tower technical definition &calculations, Treatment of cooling water (physical &chemical), Problem in cooling water treatments

b) Analytical methods &lab equipments
Recommended analytical methods, Recommended analytical equipments, Composition of reagents, Expression &interpretation of analytical result

Unit – 2 **[15]**

a) Analysis of
Raw water, clarifier water, filter water, soft water, ultra filtration water, R.O.water, D.M.Water & mixed bed water, Make up and recalculating water

b) Automation and Instrumentation for safety working at
Water treatment, Effluent treatment, In plant control method, Environment acts and guide line

c) Air pollution
Source& control equipments

Reference Books:

1) Efficient management in sugar industries by Mangalsingh
2) Geoeconomical study of waste water management of sugar industries by-S. A.Manglekar
3) Gebetz hand book
4) Nalco water treatments
5) Albtros hand books
6) Appa Awha hand book

B.Sc. Part III Sugar Technology Semester VI

Elective

Syllabus for Alcohol Technology I – DSCST37

Unit– 1 **[15]**

a) Cane molasses

Composition of molasses, gradation of molasses, storage of molasses, factors responsible for reducing the ratio (F/NF) of molasses, other use of molasses

Definition of Molasses, Total reducing sugar, Fermentable/Unfermentable sugar, Residual sugar

b) Wort, Brix, Specific gravity, Distillation, Industrial alcohol, Proof sprit, Strength of sprit, Reflux, Vaporization, Saccharification, Scaling, Scrubber, Starch, sucrose, Rectification, Gelatinization, liquefaction, Re-boiler

Unit – 2 **[15]**

a) Applied microbiology

Definition of yeast, Taxonomy of yeast, Morphology of yeast, type of micro-organism, Common strain of yeast used for alcoholic fermentation, Growth requirement of yeast, Yeast structure & function of cellular components, Metabolic pathway of yeast, Alcoholic pathway Glycolysis of EMP pathway

b) Definition & type of fermenter

Traditional batch, fed batch &continuous fermentation, Difference between batch &continuous fermentation, Alcohol production from sweet sorghum, Alcohol production from cane syrup

c) Propagation of pure yeast culture

Isolation of yeast, preservation of yeast cell, Preservation of pure culture on agar salt, Preparation of slant, purpose of propagation, Fundamental of yeast growth (Aerobic &Anaerobic), Crab tree effect, Growth kinetics, Significance of growth curve, lag phase ,log phase, stationary phase,death phase etc. Propagation stages& aspartic condition

Reference book:

1) Hand book of alcohol technology by S.V.Patil
2) Industrial alcohol technology hand book by NPCS Board of consultant &engineer

B.Sc. Part III Sugar Technology Semester VI

Elective

Syllabus for Alcohol Technology II – DSCST38

Unit – 1 **[15]**

a) Types of distillation process.
Atmospheric distillation, MPR distillation, MPR benefits of vacuum distillation, RS, ENA production/Production of anhydrous alcohol, Dehydration with molecular sieve process &membrane process

b) Distillation equipments
Columns, design & construction, maintenance, Types of trays, Types of condenser, Types of Re-boilers

Unit – 2 **[15]**

a) Effluent treatment system in Distillery,
Quality of effluent, IS specification of effluent, Biological treatments, Aerobic treatments, Anaerobic treatments

b) Manufacturing of Methane gas %composting, Raw material requirement of biogas plant, Design &capacity of biogas plant, Moisture free methane generation, Types of composting &their production, Factors affecting composting process, Economics consideration in composting process

Reference book:

3) Hand book of alcohol technology by S.V.Patil
4) Industrial alcohol technology hand book by NPCS Board of consultant &engineer

B.Sc. Part III Sugar Technology Semester VI

Syllabus for English IV (Compulsory) DSCST39

MODULE V

A. Group Discussion

B. Evolution - Alexie Sherman Alexie

MODULE VI

A. Note Making and Note Taking

B. Gateman's Gift - R. K. Narayan

MODULE VII

A. Media Writing

B. Karma - Khushwant Singh

MODULE VII

A. Bhaurao in America – P. G.Patil

B. (i) The Grass is Really Like Me- KishwarNaheed

(ii) To Granny – TejaswiniPatil

***Note: Semester VI: 10 Marks for Internal Evaluation: STUDENTS' GROUP PROJECT**

Division of Teaching Hours 8 Modules x 15 Hours = 120 Hours

Pattern Of Question Paper for English

Semester V (Paper C) **Total Marks: 40**

Q. No.	Sub Q.	Type of Question	Based on	Mark
Q.1	A	Four multiple choice questions with four alternatives to be set	Prose and Poetry	03
	B	Answer in one word/phrase/sentence each.	Prose and Poetry	03
	C	Two different Vocabulary Exercises to be set for 1 mark each	Prose and Poetry	02
Q.2	A	Answer the following questions in 3-4 sentences each. (2 out of 3)	2 on Prose and 1 on Poetry	04
	B	Write Short Note on the following in about 7-8 sentences each. (1 out of 2)	1 on Prose and 1 on Poetry	04
Q.3		Question to be set on **Interview Skills (A or B)**	Module I A	08
Q.4		Question to be set on **E-Communication (A or B)**	Module II A	08
Q.5		Question to set on English for Competitive **Examinations (A or B)**	Module III A	08

Semester VI (Paper D) **Total Marks: 40**

Q. No.	Sub Q.	Type of Question	Based on	Mark
Q.1	A	Four multiple choice questions with four alternatives to be set	Prose and Poetry	03
	B	Answer in one word/phrase/sentence each.	Prose and Poetry	03
	C	Two different Vocabulary Exercises to be set for 1 mark each	Prose and Poetry	02
Q.2	A	Answer the following questions in 3-4 sentences each. (2 out of 3)	2 on Prose and 1 on Poetry	04
	B	Write Short Note on the following in about 7-8 sentences each. (1 out of 2)	1 on Prose and 1 on Poetry	04
Q.3		Question to be set on **Group Discussion (A or B)**	Module V A	08
Q.4		Question to be set on **Note Making and Note Taking (A or B)**	Module VI A	08
Q.5		Question to set on **Media Writing (A or B)**	Module VII A	08

Practical

Practical I: Inplant training Report

A) FACTORY PRACTICE (INTERNSHIP/IN-PLANT TRAINING)
B) CANE DEPARTMENT
C) MILLING
D) BOILER
E) POWER HOUSE & ELECTRICAL DEPT.
F) CLARIFICATION SECTION
G) SULPHITER
H) CLARIFIER
I) FILTRATION
J) EVAPORATION
K) PAN FLOOR
L) CRYSTALLIZER & CENTRIFUGALS
M) CENTRIFUGALS
N) SUGAR DRYER
O) EFFLUENT TREATMENT

Practical II: Project Report on a particular subject.

Nature of Question Paper for Theory and Practical:

	Theory paper	Marks
I	Q.1 Multiple choice question. Q2. Long answer Type (2 out of 3) Q3. Short answer Type (4 out of 5)	8 marks 16 marks 16 marks
II	Internal exam–Group activity (Sem III) Case Study/ Oral (Sem-IV)	20 marks 20 marks
III	Practical Examination will be Annual	200 marks
IV	**DSCSTP9** In -plant Training **DSCSTP10** Research Project	 150 Marks 50 Marks