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

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

SU/BOS/Science/06 **Date: 01/01/2024**

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

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

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 revised syllabi, nature of question paper and equivalence 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.-III (Sem. V & VI) as per NEP-2020 (1.0)			
1.	Mathematics	12.	Computer Science (Opt)
2.	Statistics	13.	Computer Science (Entire)
3.	Physics	14.	Information Technology (Entire)
4.	Microbiology	15.	Food Science and Technology (Entire)
5.	Industrial Microbiology	16.	Food Science
6.	Electronics	17.	Food Science and Quality Control (Entire)
7.	Chemistry	18.	Food Technology &Management (Entire)
8.	Sugar Technology (Entire)	19.	Biochemistry
9.	Geology	20.	Biotechnology (Optional/Vocational)
10.	Zoology	21.	Biotechnology (Entire)
11.	Botany	22.	Environmental Science (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(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:

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)

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 Sugar industries: I
DSCST33	Advanced Sugar Technology	**DSCST38**	E1: Alcohol Technology: II E2: Water Management in Sugar industries: II
DSCST34	English – III	**DSCST39**	English – IV

Practical

DSCSTP 9	**Practical I** – In plant Training Report
DSCSTP 10	**Practical II** - Research Project

B. Sc. Part III Sugar Technology Semester V

Subject: Capacity Calculation I (Clarification House) **– DSCST – 30**

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 for $S0_2$ gas distribution system

Capacity of Equipment for process chemicals

- Calculation of optimum dose of phosphoric acid, capacity of dosing tank and pump
- Capacity of lime preparation equipments with lime pumps.
- Capacity of sculpture burner and air compressor.

Unit – 2 **[15]**

Capacity of juice heater

- Calculation of Juice heater heating surface
- 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 flash tank.
- Capacity of clarifier
- Capacity of clear juice column, &pump
- Capacity of mud tank and mud pump
- Capacity of rotary vacuum filter.
- Capacity of syrup Sulphitor and syrup pumps.

Reference books:

1) Introduction of cane sugar technology by G. H. Jenkins

2) Unit operations in cane sugar production by Jon. H. Payne.
3) Manufacturing of sugar from sugar cane by G. M. Perk.
4) Efficient management of sugar factories by Mangal singh.
5) Cane sugar manufacturing in India by D. P. Kulkarni.

B.Sc. Part III Sugar Technology Semester VI

Subject: Capacity Calculation II (Evaporation & Crystallization house) **– DSCST – 31**

Unit – 1 **[15]**

Capacity of Evaporator

- Co-efficient of heat transmission
- Quantity of water evaporation
- Properties of steam,
- Boiling point elevation.
- Heating surface of evaporator station.
- Calculation of individual Brix
- Calculation of various vapor pipe
- 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.
- Pan capacity by solid balance method
- Calculation of heating surface, and number of tubes of pan
- Calculation of vapor pipe& condensate pipe and 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 G. H. Jenkins
2) Unit operations IN cane sugar production by Jon. H. Payne.
3) Manufacturing of sugar from cane sugar by G. M. Perk.
4) Efficient management of sugar factories by Mangal singh.
5) Cane sugar manufacturing in India by D. P. Kulkarni.

B.Sc. Part III Sugar Technology Semester V

Subject: Process Instrumentation & Control – DSCST – 32

Unit – 1 **[15]**

a) Introduction of Automation and Process instrumentation,
b) Auto cane feed control system, Introduction, Need & scope, Classification, Functional elements, Calibration
c) Imbibitions water flow rate &temperature control system
Introduction, Need &scope, Classification, Functional elements, Calibration
d) Central lubricant control system
Introduction, Need & scope, Classification, Functional elements, Calibration
e) Mill drive section
Thyristor Controlled Variable speed D.C. Drives, Thyristor Converter Station (Digital type**)**
f) Auto wash system for rotary screen
Introduction, Need & scope, Functional elements,

Unit – 2 **[15]**

a) Juice flow stabilization system
Introduction, Need & scope, Functional elements,
b) Auto Ph control system
Introduction, Need & scope, Functional elements
c) Auto pan control system for batch and continuous pan
Introduction, Need & scope, Vacuum control system, Super saturation control system, Feed control system,
d) Auto feed control of centrifugal
Introduction, Need &scope, Flow control, advantages & working

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

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

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 M. S. Anand.
6) Industrial Instrumentation by H. K. Sigh.

B.Sc. Part III Sugar Technology Semester V

Subject: Advanced Sugar Technology – DSCST – 33

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, construction and working of rotary screen advantage of rotary Screen

b) Juice flow stabilization & pH control system & its configuring.
Introduction, Need & scope, and various, auto pH control system.

c) New trends in clarification
New trend in juice clarification- filtrate and syrup clarification, Advantages of above both processes.

d) Short retention time clarifier (S.R.T.)
Introduction, construction and working of S.R.T.

e) Decanter (for muddy juice treatment)
Introduction construction and working.

f) Sulphur Burner (film type)
Introduction construction and working.

Unit – 2 **[15]**

a) Steam Economy (through vapor bleeding)
Basic requirement of steam, Steam requirement when vapor is used f or entire juice heating, Steam requirement when vapor is used for juice heating and pan

boiling, on line conductivity measurement of condensate water, use of condensate Flashing of condensate, Different steam saving devices used in sugar industries.

b) Pan Automation (batch and continuous)
Pan boiling instrumentation and automation system for pan,

c) Automatic Brix and temperature control system of molasses conditioner

d) Automatic Brix and temperature control system for melter

e) 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

English Ability Enhancement Compulsory Course (CBCS)

ENGLISH FOR COMMUNICATION – DSCST – 34

SEMESTER V AECC C

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

Subject: Allied Sugar Manufacturing – DSCST – 35

Unit – 1 **[15]**

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

b) Manufacturing of Jaggery & Jaggery powder
Extraction &clarification of juice, Concentration of juice to rab, Crystallization process of Jaggery powder, Curing, process of Jaggery powder& handling process of jiggery powder.

Unit – 2 **[15]**

a) Manufacturing of refine sugar
Types of refineries, Mingling and affination process, Clarification of refine melt Evaporation & crystallization process, 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 – DSCST – 36

Unit – 1 **[15]**

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

b) Production of ethanol from cane juice
Concentration of juice, fermentation of syrup, distillation of fermented wash and dehydration of alcohol.

UNIT- 2 **[15]**

a) Bagasse
Composition of bagasse, storage of bagasse, Separation of pith from bagasse, Production of pulp and paper from bagasse , Production of particle board and fiber board from bagasse Production of corrugated boards and boxes from bagasse Production of furfural from bagasse , Production of xylitol from bagasse Production of plastic from lignin in bagasse , Production of methane & product gas from bagasse , Production of cattle feed from bagasse, 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, Use of filter cake for production of cane wax. Use of filter cake for production of bio-gas, use of filter cake as fuel, use of filter cake as cattle feed

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
Subject: Water Management In Sugar Industries I – DSCST – 37

Unit – 1 **[15]**

a) Water
Water its 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
Softeners, De-alkalization, Demineralization, application &limitation, Resin

Unit – 2 **[15]**

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

b) Boiler water treatment.

Feed water treatment, Condensate treatment, Boiler water treatment, Boiler blow down, Reasons of boiler failures, Boiler preventive maintenance, tubes internal chemical cleaning, 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) Ge betz hand book
4) Nalco water treatments
5) Albtros hand books
6) Appa Aga hand book

B.Sc. Part III Sugar Technology Semester VI

Elective
Subject: Alcohol Technology I – DSCST – 37

Unit– 1 **[15]**

a) Cane molasses

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

Definition of total reducing sugar, Fermentable/Unfermentable sugar, Residual sugar

b) Definition of 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, EMP pathway

b) Definition & types of fermenters

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), Crabtree effect, Growth kinetics, Significance

of growth curve, lag phase log phase, stationary phase & death phase. Propagation stages& astatic 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
Subject: Water Management In sugar industries II – DSCST – 38

Unit – 1 **[15]**

a) Cooling tower &cooling water treatment
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 treatment

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

Unit – 2 **[15]**

a) Analysis of
Raw water, treated water, filter water, soft water, ultra filtration water, R.O. water, D. M. Water & mixed bed water, Make up 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 Mangal singh.
2) Geoeconomical study of waste water management of sugar industries by-S. A. Manglekar
3) Ge Betz hand book
4) Nalco water treatments
5) Albtros hand books
6) Appa A ga hand book

B.Sc. Part III Sugar Technology Semester VI

Elective
Subject: Alcohol Technology II – DSCST – 38

Unit – 1 **[15]**

a) Types of distillation process.
Atmospheric distillation, MPR distillation, benefits of MPR distillation, RS, ENA production, Production of anhydrous alcohol by azeotropic distillation and molecular sieve dehydration 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, Raw material requirement of biogas plant, Design &capacity of biogas plant, Moisture free methane generation, Types of composting &their production, Factors affecting on composting process, & Economics of composting process

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

English Ability Enhancement Compulsory Course (CBCS)

ENGLISH FOR COMMUNICATION – DSCST – 39

SEMESTER VI **AECC D**

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: In plant training Report – DSCSTP 9

A) Factory Practice (Internship/In-Plant Training)
B) Cane Department
C) Milling
D) Boiler
E) Power House & Electrical Dept.
F) Clarification And Boilinf Section
G) Sulphiter
H) Clarifier
I) Filtration
J) Evaporation
K) Pan Boiling
L) Crystallizer
M) Centrifugals
N) Sugar Dryer
O) Effluent Treatment

Practical II: Research Project - DSCSTP 10

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