

# **Shivaji University, Kolhapur**



**Choice Based Credit System (CBCS)**

**B. Sc. Part III**

**Sugar Technology Entire**

**Under Faculty of Science & Technology**

**(To be implemented from Academic Year 2020-21)**

- ❖ Guidelines shall be as per B. Sc. Regular Program
- ❖ Rules and Regulations shall be as per B. Sc. Regular Program except CBCS R. B. Sc. 3 Structure of Program and List of Courses.
- ❖ Preamble :

In India sugarcane becomes industrial crop and sugar industry becomes as integrated cane processing unit wherein sugar, alcohol, energy and allied products are manufactured thus it is needed to provide technologist and scientists to the industry. At present there are two institutes which provide technical education related to the sugar industry. Namely National sugar institute Kanpur which is approved by Govt. of India. Dept. Of Food and Agriculture and Vasantdada Sugar Institute Pune which is approved by state govt of Maharashtra and it is autonomous institute. Both the institutes are providing the education in the faculty of Sugar technology, Sugar engineering, Alcohol Technology, and Instrumentation Engg, in the capacity of Post Graduates Diploma... But in India there is no provision for the Bachelor in Sugar technology. Recently Maharashtra govt. permitted to start such a carrier oriented courses under science faculty, according we are running B.Sc. (sugar technology) course since last five academic years .

❖ Structure of Program and List of Courses are as follows:

### CBCS R B. Sc. 3:

### **i) Structure of B. Sc. Sugar technology Entire**

## Programme Sem. I & II

## Structure – I

S E M E S T E R – I (Duration – 6 Months)																	
Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME									
		THEORY				PRACTICAL			THEORY				PRACTICAL				
		Credits	No. of lectures	Hours		Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min		
1	DSC-ST	2	5	4		2	4	3.2	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL				
2	DSC-ST	2							2	50							
3	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
4	DSC-ST	2							2	50							
5	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
6	DSC-ST	2							2	50							
7	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
8	DSC-ST	2							2	50							
9	AECC-A	2	4	3.2		----	----	----	2	50	50	18					
Total		18	24	19.2		8	16	12.8	-		450						
S E M E S T E R – II (Duration – 6 Months)																	
1	DSC-ST	2	5	4		2	4	3.2	2	50	100	35				As per BOS Guide-lines	50
2	DSC-ST	2							2	50							
3	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
4	DSC-ST	2							2	50							
5	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
6	DSC-ST	2							2	50							
7	DSC-ST	2	5	4		2	4	3.2	2	50	100	35					
8	DSC-ST	2							2	50							
9	AECC-B	2	4	3.2		----	----	----	2	50	50	18		200			
Total		18	24	19.2		8	16	12.8	-		450						
Grand Total		36	48	38.4		16	32	25.6			900						
<ul style="list-style-type: none"><li>• Student contact hours per week : 32 Hours (Min.)</li><li>• Total Marks for B.Sc.-I (Including English) : 1100</li><li>• Theory and Practical Lectures : 48 Minutes Each</li><li>• Total Credits for B.Sc.-I (Semester I &amp; II) : 52</li><li>• DSC – Discipline Specific Core course : All papers are compulsory.</li><li>• AECC – Ability Enhancement Compulsory Course (A &amp; B)- English</li><li>• Practical Examination will be conducted annually for 50 Marks per course (subject).</li><li>• There shall be separate passing for theory and practical courses.</li></ul>																	
(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)																	

i) Business Communication & Presentation ii) Event management iii) Personality Development, iv) Yoga & Physical Management v) Resume, Report & proposal writing

### Structure - II

S E M E S T E R – III (Duration – 6 Months)																
Sr. No.	Course (Subject ) Title	TEACHING SCHEME						EXAMINATION SCHEME								
		THEORY				PRACTICAL			THEORY				PRACTICAL			
		Credits	No. of lectures	Hours		Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min	
1	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL		
2	DSC-ST	2	3	2.4						2	50					
3	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35			
4	DSC-ST	2	3	2.4						2	50					
5	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35			
6	DSC-ST	2	3	2.4						2	50					
7	AECC-C	4	4	3.2		---	---	---				---	---			
	TOTAL	16	22	17.6		12	19.2	24				300	---			
S E M E S T E R – IV (Duration – 6 Months)																
1	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35		As per BOS Guide-lines	100
2	DSC-ST	2	3	2.4						2	50					
3	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35	100		35
4	DSC-ST	2	3	2.4						2	50					
5	DSC-ST	2	3	2.4		4	6.4	8		2	50	100	35	100		35
6	DSC-ST	2	3	2.4						2	50					
7	AECC- C AECC- D	---	---	---		---	---	---		3	70 30	100	25 10	---	---	---
	TOTAL	12 28	18 40	14.4 32		12 24	19.2 38.4	24 48				400 700	---	---	300	
• Student contact hours per week : 32 Hours (Min.)							• Total Marks for B.Sc.-II (Including EVS) : 1000									
• Theory and Practical Lectures : 48 Minutes Each							• Total Credits for B.Sc.-II (Semester III & IV) : 52									
• DSC : - Discipline Specific Core Course : All papers are compulsory.																
• AECC- Ability Enhancement Compulsory Course (C) : Environmental Studies: EVS ( Theory – 70 & Project – 30 Marks)																

- Practical Examination will be conducted annually for 100 Marks per course (subject).
- *There shall be separate passing for theory and practical courses also for Environmental Studies.*

### iii) Structure of B. Sc. Sugar Technology Programme

## Sem V & VI

### Structure - III

		S E M E S T E R – V (Duration – 6 Months)														
Sr. No.	Subject Title	TEACHING SCHEME							EXAMINATION SCHEME							
		THEORY				PRACTICAL			THEORY				PRACTICAL			
		Credits	No. of lectures	Hours		Credits	No. of lectures		Hours	Hours	Theory	Internal	Min Marks	Hours	Max Marks	Min Marks
1	DSE-E	2	3	2.4	8	20	16		2	40	10	14+4=18	PRACTICAL EXAMINATION IS ANNUAL			
2	DSE-E	2	3	2.4					2	40	10	14+4=18				
3	DSE-E	2	3	2.4					2	40	10	14+4=18				
4	DSE-E1/E2/E3	2	3	2.4					2	40	10	14+4=18				
5	AECC-E	2	4	3.2					---	---	---	2				40
	TOTAL	10	16	12.8	8	20	16		200	50	---					
S E M E S T E R – VI (Duration – 6 Months)																
1	DSE-F	2	3	2.4	8	20	16		2	40	10	14+4=18	As per BOS Guidelines	200	70	
2	DSE-F	2	3	2.4					2	40	10	14+4=18				
3	DSE-F	2	3	2.4					2	40	10	14+4=18				
4	DSE-F1/F2/F3	2	3	2.4					2	40	10	14+4=18				
5	AECC-F	2	4	3.2					---	---	---	2	40	10	14+4=18	---
TOTAL		10	16	12.8	8	20	16		200	50	---					
GRAND TOTAL		20	32	25.6	16	40	32		400	100	--	---	200			
• Student contact hours per week : 32 Hours (Min) • • Total Marks for B.Sc.-III (Including English) : 700																
• Theory and Practical Lectures : 48 Min. Each • • Total Credits for B.Sc.-III (Semester V & VI) : 36																
• DSE- Discipline Specific Elective : All papers are compulsory. Except DSC E1/E2/E3 & DSC F1/F2/F3																
• AECC- Ability Enhancement Compulsory Course (E & F) : English																
• Practical Examination will be conducted annually for 200 Marks.																
• There shall be separate passing for theory, internal and practical.																
(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)																
For Sem V: CCC – II : Constitution of India and Local Self Government																
(B) Non-Credit Self Study Course : Skill Development Courses (SDC)																
For Sem VI: SDC – II: Any one from following (vi) to (x)																

vi) Interview & Personal Presentation Skill, vii) Entrepreneurship Development Skill, viii) Travel & Tourism, ix) E-Banking & Financial Services, x) RTI & Human Right Education (HRE), IPR & Patents

### **CBCS B. Sc. : Sugar technology Entire : List of courses:**

#### **i) B. Sc. Part 1 (Sem. I & II)**

<b>Course code</b>	<b>Name of Course</b>	<b>Course code</b>	<b>Name of Course</b>
<b>Sem I</b>		<b>Sem II</b>	
<b>DSC ST1</b>	Applied Chemistry – I (Sugar chemistry)	<b>DSC ST9</b>	Applied Chemistry – II (Organic chemistry)
<b>DSC ST2</b>	Applied Chemistry – I (Bio chemistry)	<b>DSC ST10</b>	Applied Chemistry – II (Physical chemistry)
<b>DSC ST3</b>	Applied Physics-I (Properties of Material & Thermodynamics)	<b>DSC ST11</b>	Applied Physics-II (Basic Instrumentation)
<b>DSC ST4</b>	Applied Physics-I (Optics & Crystallography)	<b>DSC ST12</b>	Applied Physics-II (Sugar Instrumentation)
<b>DSC ST5</b>	Applied Maths-I (Algebra & Geometry)	<b>DSC ST13</b>	Applied Maths-II (Descriptive statistics)
<b>DSC ST6</b>	Applied Maths-I (Differential Integration & calculus)	<b>DSC ST14</b>	Applied Maths-II (Probability Theory)
<b>DSC ST7</b>	Sugarcane Agriculture– I (Sugar cane Agronomy)	<b>DSC ST15</b>	Sugar manufacturing– I (Clarification)
<b>DSC ST8</b>	Sugarcane Agriculture– I (Sugar cane Pathology)	<b>DSC ST16</b>	Sugar Manufacturing– I (Evaporation)
<b>AECC – A</b>	English – I	<b>AECC – B</b>	English – II

#### **Practical**

<b>DSC STP1</b>	Applied Chemistry I & II	<b>DSC STP3</b>	Sugar Cane Agriculture –I & Sugar Manufacturing-I
<b>DSC STP2</b>	Applied Physics I & II	<b>DSC STP4</b>	Applied Maths I & II

DSC ST:- Discipline Specific Core Course Sugar Technology

AECC:- Ability Enhancement Compulsory Course: Compulsory English

**ii)B.Sc. Part 2 (Sem III & IV)**

Course code	Name of Course	Course code	Name of Course
<b>Sem III</b>		<b>Sem IV</b>	
<b>DSC ST17</b>	Sugar Engineering-(Mill House)	<b>DSC ST23</b>	Chemical Engineering-(Heat & Moment Transfer)
<b>DSC ST18</b>	Sugar Engineering-(Boiler & Turbine)	<b>DSC ST24</b>	Chemical Engineering-(Unit Operation)
<b>DSC ST19</b>	Sugar manufacturing: II (crystallization)	<b>DSC ST25</b>	Capacity Calculation-(Clarification)
<b>DSC ST20</b>	Sugar Manufacturing: II (Centrifugal)	<b>DSC ST26</b>	Capacity Calculation-(Evaporation & Crystallization )
<b>DSC ST21</b>	Equipment Design-(Clarification)	<b>DSC ST27</b>	Chemical Control-(Mill House)
<b>DSC ST22</b>	Equipment Design-(Evaporation & Crystallization)	<b>DSC ST28</b>	Chemical Control-(Boiling House)
<b>AECC – C</b>	Environmental Studies (Theory)	<b>AECC – D</b>	Environmental Studies (Project)

**AECC-C :-** Ability Enhancement Compulsory Course: Environmental Studies

**Practical**

<b>DSC STP5</b>	Sugar manufacturing	<b>DSC STP7</b>	Chemical control
<b>DSC STP6</b>	Sugar Engineering		

**iii) B. Sc. Part 3 (Sem V & VI)**

**Discipline Specific Elective (DSE)**

Course code	Name of Course	Course code	Name of Course
<b>Sem V</b>		<b>Sem VI</b>	
<b>DSE ST29</b>	Process Instrumentation & Control: I	<b>DSE ST33</b>	Allied Sugar Manufacturing
<b>DSE ST30</b>	Process Instrumentation & Control :II	<b>DSE ST34</b>	Allied Co Product Manufacturing
<b>DSE ST31</b>	Advanced Sugar Technology	<b>DSE ST35</b>	E1:Alcohol Technology: I, E2:Water Management in Cogen: I, E3:Buisness Management and Marketing: I
<b>DSE ST32</b>	Advanced Sugar Engineering	<b>DSE ST36</b>	F1:Alcohol Technology: II, F2:Water Management in Cogen: II, F3:Buisness Management and Marketing: II
<b>AECC – E</b>	English – III	<b>AECC – F</b>	English – IV

**Practical**

<b>DSC STP8</b>	In plant Training & Viva (Project Report)
<b>DSC STP9</b>	Technical Essay (Self Study)

**B.Sc. III (Sugar Technology) Sem. - V**  
**Syllabus for Process Instrumentation & control – I**  
**Credit - 1**  
**(Mill Section)**

- 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)

**Credit – 2**

**(Boiler section)**

**[15]**

- a) DCS for boiler control  
Introduction, need and scope, classification, level measuring instruments, flow measuring instruments, flow diagram
- b) fly ash control system  
Introduction, need and scope, construction and working, flow diagram.
- c) Turbine section  
DCS for turbine control, Introduction, need and scope, Flow diagram, Construction and working, Advantages.

**B.Sc. III (Sugar Technology) Sem. - V**  
**Process Instrumentation & Control - II**

**Credit – 1**

**[15]**

- a) Auto pan control system.

Introduction, Need & scope, Vacuum control system, Super saturation, control system, Feed control system, Flow diagram , Working

b) Auto molasses conditioning system

Introduction, Need & scope, Brix control system , Temperature control system, Working

c) Brix & temperature control system for melter

Introduction, Need & scope, Brix control system, Temperature control system, Working

d) Auto feed control of centrifugal feed.

Introduction, Need & scope, Flow control, advantages, Working

e) Auto super heated wash system for centrifugal

Introduction, Need & scope, Temperature & pressure control, advantages, Working

**Credit - 2**

**[15]**

a) DCS System for centrifugal operation

Introduction, need and scope, Masecuite charging control, Screen & sugar wash control, Sugar discharging control, flow diagram

b) Automatic weighing , numbering and bagging system

Introduction, need and scope, Advantage

c) Computer software development for Daily, weekly, monthly yearly report

Introduction, need and scope, Advantage

**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.

**B.Sc. III (Sugar Technology) Sem. - V**

**Advance Sugar Technology - I**

**Credit - 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.

**Credit – 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,

**B.Sc. III (Sugar Technology) Sem. - V**

**Advance Sugar Engineering - II**

**Credit – 1**

**[15]**

- a) Mill Efficiency  
Various factors affecting milling capacity and efficiency
- b) Mill control  
Auto cane feeding control system for uniform feed rate, Automatic imbibitions water flow and temperature control system, Central lubricant system
- c) Pressure feeding system  
TRPE.GRPF.UFR
- d) Two roller mill

**Credit – 2**

**[15]**

- a) Cane diffuser  
Heat and mass balance in cane diffuser, construction and working of the diffuser, comparison of cane diffuser with mill
- b) Co-generation of surplus power and its potential.
- c) power saving device  
A.C.VFD drive  
Planetary gearbox
- d) Heat recovery unit  
Flash recovery system, condensate heat recovery system, H.P heater for High pressure boiler, vapcon system, sulphur burner
- e) Boiler water Treatment  
Boiler Feed Water Treatment Plant, chemical treatment system

**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. III (Sugar Technology) Sem. - VI**

**Allied Sugar Manufacturing-I**

**Credit – 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

**Credit – 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. III (Sugar Technology) Sem. VI**

**Allied Sugar Co – Products -II**

**Credit – 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

**Credit – 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
- 5) (1990) glance at distillery by-products DSTA 40<sup>th</sup> convention.

- 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

**Credit – 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.

**B.Sc. Part III Semester VI**

**Water Management in Co-generation Plant-II**

**Credit – 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

**Credit – 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
  - i) Make up and recalculation 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  
Nalco water treatments  
Albtros hand books  
Appa Awha hand book

**B.Sc. Part III Semester VI**

**Alcohol Technology - I**

**Credit – 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 spirit, Strength of \spirit, Reflux, Vaporization, Saccharification, Scaling, Scrubber, Starch, sucrose, Rectification, Gelatinization, liquefaction, Re-boiler

**Credit – 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

**Credit – 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

**Credit – 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:**

- 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 Semester VI****Business management & marketing-I****Credit – 1****[15]**

a) Introduction

Nature of sugar & allied industries, Flow diagram of sugar manufacturing process from cane, Flow diagram of alcohol production from molasses, Flow diagram of power generation from bagasse, Flow diagram of compost from press mud, Flow diagram of ethanol production from alcohol, Flow diagram of methane from spent wash

b) Manufacturing cost of sugar and allied products

Raw material cost, Harvesting & transport cost, Repairing and maintenance cost, Chemical cost, Store consumption cost, packing cost, selling cost, distribution & adm. . . Expenses, Audit system

**Credit – 2**

**[15]**

a) Financial cost

Promoters contribution, Govt. contribution, loans from Bank, Govt. subsidy, Tax credit and refunds Working capital

b) Managements

Need, sources and determinants setting of sugar industry, Construction of new sugar factory in Public, Private, Co-operative & Govt. undertaking field Selection of location ,licensing norms for aerial distance, market survey of sugar, Environment clearance, Public hearing ,industrial licensing, govt. related policies

**B.Sc. Part III Semester VI**

**Business Management & Marketing – II**

**Credit – 1**

**[15]**

- a) Statutory laws applicable to sugar & allied  
Essential commodities acts 1955, Sugar control order -1966, Sugar cane control order -1966, Levy sugar supply order-1979 Sugar packing and marketing order - 1970, Sugar developments funds rule - 1983, SMP/FRP(statutory minimum price/fair & remunerative price) of sugar cane, SAP (State advisory price) of sugar cane, The amended orders to all above original orders
- b) Labor acts  
Grade & scale fixations wage board laws, Gratuity laws, Provident laws, Bonus acts, Factory acts, Service tax acts.
- c) Excise /taxation acts  
Central excise duty on sugar, State excise duty on molasses, State excise duty on bagasse and press mud, Energy laws on power, Vat on sugar & by-products, GST tax on sugar & by - products

**Credit – 2**

**[15]**

- a) Marketing of sugar & by products  
Introduction, Nature, scope & core concept of marketing, Marketing planning process, Marketing segmentation-Meaning, Concept, Benefits & Doubts, Marketing of sugar- levy, free export/import, damage sugar etc., Marketing of by-product, Molasses, Bagasse, Press mud
- b) Global & domestic scenario of sugar  
Global production & consumption, Domestic production & consumption, Indian sugar standard, handling and storing of sugar

**Reference book-**

- 1) Financial management By Ravi Kishor
- 2) Cost accounting By Jawaher lal
- 3) Marketing management By Tapan Panda