SHIVAJI UNIVERSITY, KOLHAPUR

New Syllabus

for

Bachelors of Science (Sugar Technology)

Part-III (Semester-V and Semester-VI)

Syllabus to be approved for 2017 onwards

B.Sc. Part-III, Sugar Technology (to be approved for 2017 onward)

Semester-V, No of papers -5: Theory

Sr no	Existing paper title	Proposed paper title
1	English	English
2	Applied chemistry- Paper-ix	Process instrumentation & control- I
3	Advance sugar industries & technology- Paper -x	Advance sugar technology
4	Equipment design &capacity calculation Paper -xi	Allied sugar manufacturing
5	Elective: 1) Water management in cogeneration Or 2) Alcohol technology Or 3) Automation process control and instrumentation Or 4) Business management and marketing	Elective: 1) Water management in cogeneration- I Or 2) Alcohol technology-I Or 3) Business management and marketing- I

B.Sc. Part-III, Sugar Technology (to be approved for 2017 onward)

Semester-VI, No of papers -5: Theory

Sr no	Existing paper title	Proposed paper title
1	English	English
2	Applied chemistry- Paper- ix	Process instrumentation &control- II
3	Advance sugar industries & technology- Paper-x	Advance sugar engineering
4	Equipment design &capacity calculation Paper-xi	Allied sugar co-products
5	Elective: 1) Water management in cogeneration Or 2) Alcohol technology Or 3) Automation process control and instrumentation Or 4) Business management and marketing	Elective: 1) Water management in cogeneration- II Or 2) Alcohol technology- II Or 3) Business management and marketing-II

B.Sc. Part-III, Sugar Technology (to be approved for 2017 onward)

Semester-V, No of papers -5: Theory

Sr no	Paper title	Theory	Term work	Practical	Total
1	English	50	-	-	50
2	Process instrumentation &control- I	50	-	-	50
3	Advance sugar technology	50	-	-	50
4	Allied sugar manufacturing	50	-	-	50
5	Elective: 1) Water management in cogeneration- I Or 2) Alcohol technology- I Or 3) Business management and marketing- I	50	-	-	50
6	Total	250	-	-	250

Semester-VI, No of papers-5: Theory

Sr no	Paper title	Theory	In-plant training	Project	Total
1	English	50	-	-	50
2	Process instrumentation &control- II	50	-	-	50
3	Advance sugar engineering	50	-	-	50
4	Allied sugar co-products	50	-	-	50
5	Elective: 1) Water management in cogeneration-II Or 2) Alcohol technology-II Or 3) Business management and marketing-II	50	-	-	50
6	In plant training	-	150	-	150
7	Technical essay	-	-	50	50
8	Total	250	150	50	450

B.Sc. Part- III,
Sem- V, Theory 250 marks
Sem- VI, Theory 250 marks + 200 Marks in plant training and technical essay**.**

B.Sc., Part-III, Semester-V
Process instrumentation &control-I

Unit 1 (Mill section) [8]

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.

Unit 2 (Mill drive section) [9]

a) Thyristor Controlled Variable speed D.C. Drives
b) Thruster Converter Station (Digital type**)**

Unit 3 (Boiler section) [8]

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.

Unit4 (Turbine section) [9]

DCS forturbine control
Introduction,need and scope, flow diagram, construction and working, advantages.

Reference Books:

Hand book of sugar engineering-H. Eugot.
Industrial automation –process control &instrumentation- S. Medida
The complete book on sugar cane processing – H. Panda
Instrumentation &automation in sugar industries-S.S. Engineering.
Instrumentation –Shivaji University- M.S. Anand

B. Sc., Part-III, Semester-V
Advance sugar technology

Unit 1 [8]

Effect of bagasillo onmanufacturing process. Its removal by DSM screen, rotary screen & two stage rotary screen. Advantage of rotary screen. On line mass flow meter for juice weighment. Auto PH control system for juice clarification. New trend in juice clarification- filtrate and syrup clarification. Advantages of above both processes.

Unit 2 [9]

Tray less clarifier or short retention time (S.R.T.) clarifier, its construction and working.
Decanter for muddy juice treatments, its construction and working.
Film type sulphur burner, Instrumentation and automation for film type sulphur burner.

Unit 3 [8]

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.

Unit 4 [9]

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

Reference Books:

Hand book of cane sugar technology- G.H. Jenkins
Cane sugar manufacturing in India- D.P. Kulkarni
Hand book of cane sugar- Meade and Chen
Hand book of cane sugar- R.B.L. Mathur
Proceeding of STA &DSTA of India.

B. Sc., Part-III, Semester-V
Allied sugar manufacturing

Unit 1 [8]
Manufacturing of raw sugar
Clarification process
Crystallization process
Centrifugal process

Unit 2 [12]
Manufacturing of refine sugar
Types of refineries
Mingling and affination process.
Clarification of refine melt
Evaporation &crystallization
Specification of refine sugar

Unit 3 [7]
Manufacturing of Khandsari sugar
Specification of Khandsari sugar.
Extraction &clarification of cane juice.
Open pan boiling system
Purging drying &packing system.

Unit 4 [7]
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.

Reference Books:

Hand book of sugar refinery- Chung Chi Chou
Manufacture &refining of raw sugar-V.E. Baikow

ELECTIVE SUBJECTS:

B. Sc., Part- III, Semester-V
Water management in cogeneration-I

Unit 1 Water [7]
Water properties &nature, Source of water, Uses of water &basic chemistry, Water related table

Unit 2 Treatments [7]
Filtration, Clarification, Oxidation, Chlorination, De-aeration

Unit 3 Ion-exchange method [7]
Softener, De-alkalization, Demineralization application &limitation. Resin

Unit 4 Membrane technology [7]
Ultra filtration, Nano filtration, Reverse osmosis, Electro-dialysis

Unit 5 Boiler water treatments [7]
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- Mangal Singh
2. Geoeconomical study of waste water management of sugar industries- S.A. Manglekar
3. Ge betz hand book
4. Nalco water treatments
5. Albtros hand books
6. AppaAwha hand book

B.Sc., Part-III, Semester-V
Alcohol Technology-I

Unit 1- Cane molasses. [8]

a) Composition of molasses, gradation of molasses, storage of molasses, factors responsible for reducing the ratio (F/NF) of molasses. Other use of molasses.
b) Definition of -

Molasses,Total reducing sugar, Fermentable/Unfermentable sugar, Residual sugar. Wort, Brix, Specific gravity, Distillation, Industrial alcohol, Proof sprit, Strength of sprit, Reflux, Vaporization.
Saccharification,Scaling,Scrubber, Starch -sucrose,Rectification, Gelatinization, liquefaction, Reboiler

Unit 2- Applied microbiology. [9]

Definition of yeast, Taxonomy of yeast
Morphology of yeast, type of microorganism.
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

Unit 3- Defination & type of fermentor [8]

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

Unit 4- Propagation of pure yeast culture. [9]

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 Books:

Hand book of alcohol technology- S.V. Patil
Industrial alcohol technology hand book- NPCS Board of consultant & engineer

B. Sc., Part-III, Semester-V
Business management & marketing-I

Unit 1- Introduction

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

Unit 2- 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 &administrative cost. Expenses. Audit system.

Unit 3- Financial cost.

Promoters contribution , Govt. contribution, loans from Bank, Govt. subsidy, Tax credit and refunds
Working capital, Managements-need, sources and determinants

Unit 4-Setting of sugar industry

Construction of new sugar factory in Public, Privet, 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.

Reference Books:

1. Financial management- Ravi Kishor
2. Cost accounting- Jawaher Lal
3. Marketing management- Tapan Panda

B.Sc., Part-III, Semester-VI
Process instrumentation &control-II

Unit 1 [8]

Auto pan control system.
Introduction, Need &scope
Vacuum control system
Super saturation control system
Feed control system.
Flow diagram, Working
Auto molasses conditioning system
Introduction, Need &scope
Brix control system
Temperature control system
Working

Unit 2 [9]

Brix &temperature control system for melter
Introduction, Need &scope
Brix control system
Temperature control system
Working

a) Auto feed control of centrifugal feed.
Introduction, Need &scope, Flow control, Advantages,Working
b) Auto super-heated wash system for centrifugal
Introduction, Need &scope, Temperature &pressure control, Advantages, Working.

Unit 3 [8]

a) DCS System for centrifugal operation
Introduction, need and scope, Massecuite charging control, Screen &sugar wash control, Sugar discharging control, Flow diagram
b) automatic weighing, numbering and bagging system
Introduction, need and scope, Advantage.

Unit 4 [9]

Computer software development for daily, weekly and monthly yearly report.
Introduction, need and scope, Advantage.

Reference Books:

Hand book of sugar engineering -H. Eugot.
Industrial automation –process control &instrumentation- S. Medida
The complete book on sugar cane processing –H. Panda
Instrumentation &automation in sugar industries-S.S. Engineering.
Instrumentation –Shivaji University-M.S. Anand

B.Sc., Part- III, Semester-VI
Advance sugar engineering

Unit 1 [7]

a) Various factors affecting milling capacity and efficiency.
b) Auto motion at mills: Auto cane feeding control system for uniform feed rate. Automatic imbibitions water flow and temperature control system. Central lubricant system.

Unit 2 [7]

a) Pressure feeding system-TRPE.GRPF.UFR
b) Two roller mill

Unit 3 [7]

a) Cane diffuser, heat and mass balance in cane diffuser. comparison of cane diffuser with mill
b) Co-generation of surplus power and its potential.

Unit 4 [7]

a) power saving device
-A.C.VFD drive
-planetary gearbox
b) Heat recovery unit
-flash recovery system
-condensate heat recovery system
-H.P heater for High pressure boiler.
-Vapcon system for sulphur burner

Unit 5 [7]

Boiler Feed Water Treatment Plant
Chemical treatment system

Reference Books:

Hand book of sugar engineering -H. Eugot
Hand book of cane sugar -R.B.L. Mathur
Cane sugar engineering-Peter Rein
Machinery and equipments of cane sugar factory- Tromp.

B.Sc., Part-III, Semester-VI
Allied sugar co-products

Unit 1 [8]
Molasses
Composition of molasses, storage of molasses
Quality of molasses –pre clarification of molasses.
Molasses for production of alcohol, yeast, acetone, glycerin, cattle feed-(process)
Other use of molasses in different countries.

Unit 2 [9]
Bagasse
Composition of bagasse, storage of bagasse
Separation of pith from bagasse
Production of pulp and paper, particle board and fiber board, corrugated boards and boxes, furfural, xylitol, plastic from lignin in bagasse, methane &product gas, cattle feed from bagasse-process.
Other use of bagasse and bagasse ash.
Generation of surplus power from bagasse

Unit 3 [9]
Press mud (filter cake)
Composition of filter cake
Use of filter cake as fertilizer, fuel, cattle feed, for production of cane wax, bio-gas-process

Unit 4 [8]
Production of ethanol from cane juice.

Reference Books:

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

ELECTIVE SUBJECTS:

B. Sc., Part-III, Semester-VI
Water management in cogeneration-II

Unit 1-Cooling tower & cooling water treatments [8]
- 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

Unit 2- Analytical methods & lab equipments [9]
- Recommended analytical methods
- Recommended analytical equipments
- Composition of reagents
- Expression &interpretation of analytical result

Unit 3 Analysis of [8]
- Raw water, clarifier water, filter water, soft water, ultrafiltration water, R.O. water
- D.M. Water &mixed bed water
- Make up and recalculating water

Unit 4 a) automation and instrumentation for safety working at [9]
- Water treatment
- Effluent treatment
- In plant control method

b) Environment acts and guide line.
c) Air pollution: source &control equipments.

Reference Books:

1. Efficient management in sugar industries- Mangal Singh
2. Geoeconomical study of waste water management of sugar industries- S.A. Manglekar
3. Ge betz hand book
4. Nalco water treatments
5. Albtros hand book

B.Sc., Part-III, Semester-VI
Alcohol technology-II

Unit 1- Types of distillation process. [8]
Atmospheric distillation
MPR distillation
MPR benefits of vacuum distillation, RS, ENA production.
Production of anhydrous alcohol.
Dehydration with molecular sieve process &membrane process.

Unit 2-Distillation equipments [9]
Columns, its design & construction, its maintenance.
Types of trays
Types of condenser.
Types of Reboiles

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Unit 3-Effluent treatment system in distillery [8]
Quality of effluent, IS specification of effluent.
Biological treatments.
Aerobic treatments,
Anaerobic treatments

Unit 4- Manufacturing of methane gas %composting. [9]
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 Books:

Hand book of alcohol technology- S.V. Patil
Industrial alcohol technology hand book- NPCS Board of consultant &engineer

B. Sc., Part-III, Semester-VI
Business management &marketing-II

Unit 1- Statutory lows applicable to sugar & ailed [8]

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.

Unit 2- a) Labor acts [9]

Grade &scale fixations wage board lows.
Gratuity laws.
Provident lows.
Bonus acts.
Factory acts.
Service tax acts.

b) Excise/taxation acts.
Central excise duty on sugar
State excise duty- on molasses
State excise duty on bagasse and press mud.
Energy lows on power.
Vat on sugar &by products,
GST tax on sugar &by products,

Unit 3- Marketing of sugar &by products. [8]

Introduction-Nature, scope &core concept of marketing.
Marketing planning process.
Marketing segmentation-Meaning, Concept, Benefits &Doubts.
Marketing of sugar-leavy, free export/import, damage sugar, etc.
Marketing of by-product,-Molasses. Bagasse, Press mud.

Unit 4 - Global &domestic scenario of sugar. [9]

Global production &consumption, Domestic production &consummation.
Indian sugar standard ,handling and storing of sugar.

Reference Books:

Financial management- Ravi Kishor
Cost accounting- Jawaher Lal
Marketing management-Tapan Panda