

SHIVAJI UNIVERSITY, KOLHAPUR

New Syllabus for

Master of Science (Alcohol Technology)

Part-II (Semester-III and Semester-IV)

Syllabus to be approved from June 2017 onwards

Master of Science (Alcohol Technology)
Part-II (Semester–III, Semester–IV)
Syllabus to be approved from June 2017 onwards

M. Sc., PART-II (SEMESTAR-III)

Paper: IX (FT)-FERMENTATION TECHNOLOGY-III

UNIT – 01

[15]

Introduction to fermentation process

Microbial biomass, Microbial enzyme, Microbial metabolites, Recombinant products, Transformation processes

UNIT – 02

[15]

Batch culture, Continuous culture, multistage systems, feedback systems:- Internal feedback, external feedback, Comparison of Batch & Continuous culture in industrial processes, Biomass productivity, Metabolite productivity, continuous brewing, continuous culture & Biomass production, comparison of batch & continuous culture as investigative tools.

Fed-Batch culture

Variable volume fed-batch culture, fixed volume fed-batch culture, cyclic fed-batch culture, application of fed-batch culture, Examples of the use of fed-batch culture.

UNIT – 03

[15]

The isolation, preservation & improvement of industrially important microorganism

The isolation of industrially important microorganisms, isolation methods utilizing selection of the desired characteristics:- Enrichment culture, Enrichment cultures using solidified media, Isolation methods not utilizing selection of the desired characteristics screening methods, The preservation of industrially important micro-organisms, storage at reduced temperature, storage on agar slopes, Storage under liquid nitrogen, Storage in a dehydrated form:- dried culture, Lyophilization, Quality control of preserved stock cultures, the improvement of industrial micro-organisms, the selection of induced mutants synthesizing improved levels of primary metabolites, modification of the permeability, the isolation of mutants that do not recognize the presence of inhibitors or repressor, Examples of the use of auxotrophs for the production of primary metabolite, the isolation of mutants that do not recognize the presence of inhibitors & repressors the isolation of induced mutants producing improved yields of secondary metabolites.

UNIT – 04

[15]

Introduction, typical media, medium formulation, water, energy source, carbon source, factors influencing the choice of Carbon source:- examples of

commonly used carbon source, carbohydrates, oil & fats, Hydrocarbons & their derivatives, Nitrogen source :- examples of commonly used nitrogen source, factors influencing the choice of nitrogen source, Minerals: chelators, growth factors, Nutrient recycle, buffers, the addition of precursors & metabolic regulators to media: precursors, Inhibitors, Inducers, oxygen requirements: Fast metabolism, Rheology, Antifoams, Medium optimization: Animal cell media, serum, serum free media supplements, protein- free media, Trace elements, Osmolality, pH, Non-nutritional media supplements.

Reference Books:

- 1) Industrial micro-biology - L.E. Casidazok
 - 2) Principle of fermentation technology- second edition P. F. Standburg, A.Whotakar, S.J. Hall
 - 3) Bio-technology-Walf crueger and Annelise cruengo
 - 4) Fermentation technology & biotechnology second edition
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M. Sc., PART-II (SEMESTAR -III)

Paper: X (AT)-ALCOHOL TECHNOLOGY- III

UNIT -01

[15]

Fed batch/Continuous fermentation

Theoretical aspects of continuous fermentation, various types of continuous fermentation systems, continuous Vs Batch Fermentation Systems Single Fermentation Continuous System (Biostil), Process Details with flow diagrams, Operational aspects, details of plant & machinery. Merits & demerits of the technology, Cascade continuous Fermentation system,, Process details with flow diagram, operational aspects, details of plant & machinery, merits and demerits of technology, Yeast Flocculation Continuous Fermentation System (Encillium -NCL), Process details with flow diagram, operational aspects, details of plant & machinery, Merits & Demerits of technology, Evaluation of Continuous fermentation Technologies.), Process details with flow diagram, operational aspects, details of plant & machinery, Merits & Demerits of technology, Hiferm -xp continuous fermentation process without yeastrecycling. Dry & wet gauging of tanks. Contamination control with special reference to continuous fermentation process.

UNIT – 02

[15]

Alcohol from Non-molasses sources and manufacture of malt alcohol, and cost of production of alcohol

Characterization of various non-molasses sources for alcohol production. Process details of alcohol production from Corn, Sweet Sorghum, Tapioca, Sugarcane Juice and others, Quality aspects of alcohol from non- molasses sources, Production of alcohol from non-molasses sources in the existing molasses based distillery. Manufacture of liquors-Rum, Whisky, Gin, Vodka, brandy, Cachaca, Taquilla etc. & bottling, packing of liquors. Reduction & blending of spirit. Blending and sensory analysis of various spirit and liquors. Details of production of malt alcohol.

UNIT – 03

[15]

Multi pressure distillation and Molecular sieve dehydration system.

Mechanism, flow diagram and concepts behind Molecular sieve and MPR distillation. The quality aspects of spirit using MPR distillation.

Importance of Spectroscopic and chromatographic techniques in alcohol industries

Introduction to various spectroscopic and chromatographic techniques useful for alcohol industry. Role of GC-MS, GC, HPLC, HPTLC and other sophisticated instruments in analysis of molasses, fermented wash, RS, ENA, AA, SDS, beer, wine and various beverages

UNIT – 04

[15]

Yeast & its uses

Introduction, Production of Brewers yeasts Production of Baker's yeast Production of food & fodder yeasts Use of yeast and its products.

Reference Book:

1. The Alcohol Textbook – Jacques, T. P. Lyons & D. R. Kelsall
2. Alcoholometry – Satyanarayana Rao
3. Handbook of Fermentation & Distillation – A.C. Chatterjee
4. Distillation – H.C. Barron
5. Technical Excise Manual
6. Byproducts of sugar industry – Paturao

M. Sc., PART-II (SEMESTAR -III)

Paper: XI- MICROBIOLOGY-III (INDUSTRIAL MICROBIOLOGY)

UNIT-1

[15]

History & developments

Introduction, The era of the discovery of microbes, Pasteur & fermentation, The era of the discovery of antibiotics A century of growth of industrial fermentation.

UNIT - 02 Microbiobial cell & fermentation products.

Baker's yeast, food and feed yeasts, bacterial insecticides, legume inoculants, mushroom, Algae, Vitamin and growth stimulants, vitamin B12 (Cobamide), Riboflavin, vitamin A, Gibberellins, Organic acids-citric acid, fumaric acid, Itaconic acid, Kojic acid, Bacterial gluconic acid, α Ketoglutaric acid

UNIT - 03 [15]

Production of single - cell proteins

Introduction, Bacterial proteins, Actinomycetous proteins, Yeasts portions
Fungal portions Algal portions economic aspects, future.

UNIT- 04 [15]

Antibiotics

Introduction Classification of Antibiotics

a) Penicillin, Streptomycin, Tetracycline, Griseofulvin

b) Enzymes

General aspects of Enzymes production, Amylases, Proteases, Pectinases

Other Enzymes

Reference Book:

1. General Microbiology, IV edn. Mac Millan Press. Stanier, R.Y., Adelberg, E.A. and Ingraham, J.L.
2. Microbiology, V Ed., Pelczar, M.J., Chan, E.C.S. and Krieg, N.R.,
3. Microbiology, Prescott. L.M., Harley J.P. and L. Kreig D.A.
4. Microbial Biology, Rosenberg, E & Cohen I.R.
5. By Products of Sugar Industry- Paturao
6. Whisky Technology, Production & Marketing -Inge Russell

ELECTIVE SUBJECTS:

M. Sc., PART-II (SEMESTAR-III)

Paper: XII- Sugar Technology

UNIT – 01 [15]

Clarification

Brief account of sugar industry & sugar manufacturing process, composition of cane & juice, Importance of juice clarification, various process used in sugar production.

UNIT - 02**[15]****Evaporation**

Theory of evaporation, Construction of evaporation body, various types of the evaporators, entrainment catcher & various types of catcher, condenser, type of the condenser & quantity of water required to condenser, steam economy with theory, syrup treatment.

UNIT – 03**[15]****Crystallization**

Theory of crystallization, principle & practice in graining, principle & practice in massecuite formation, various massecuite boiling scheme, cooling of the massecuite and its system.

UNIT – 04**[15]****Centrifugal**

Theory of the centrifugal, type of the centrifugal, operation centrifugal machine, drying & cooling of the sugar, gradation of sugar weighing & packing of sugar, Handling & storage of the sugar, keeping Quality of sugar.

Reference Book:

1. Hand book of cane sugar- E. Hugot
2. Cane sugar engineering- Peter Rain.
3. Machinery & equipments of sugar factory - L. A. Tromp
4. Cane sugar hand book- R. B. L. Mathur
5. Modern milling of sugar cane- Maxwell
6. Standard fabrication practices of cane sugar mill- Delden.

OR

ELECTIVE SUBJECTS:**M. Sc. PART-II (SEMESTAR-III)****Paper: XII- Industrial waste treatments & Environmental management****UNIT – 01****[15]****Waste generation & characteristics of effluent. IS norms.**

Biological treatment fundamentals, Waste treatment methods- Types & Selection Criteria, Aeration principles, Aeration & types of system, Composting – microbial aspects & silent features, Economics consideration in composting process, Microbiology & Conversion process in anaerobic fermentation, Kinetics of methane fermentation. Energy generation and

types of anaerobic system, Incineration – Theoretical, considerations, types, incineration systems in practice, Type of secondary treatment system.

UNIT – 02

[15]

Winery and brewery sanitization and waste disposal regulations

Winery sanitization- The Importance of Cleaning and Sanitation in the Winery, Basic Cleaning, Water Quality, The Solution: Cleaning compounds, Cleaning Equipment, Sanitizing and Sanitizers, Sterilizing and Sterilizers, Hardware: Tanks, Pumps, Hops, Walls, Floors, Ceilings, Drains, Solid and Liquid Waste Disposal, Government Regulations, Safety, OSHA, EPA, DNR, MSDS, Sanitation Plan.

UNIT- 03

[15]

Waste water disposal systems in industries

Waste Beer, solid waste materials, wastewater disposal and treatments. Sludge treatment, Disposal and Utilization, Land application of Brewery Effluents, Production of single cell protein from Brewery Effluents.

UNIT – 04

[15]

Water conservation in distilleries

Requirement of total water for process and non-process in typical 30 KLPD molasses based distillery. Scope for water recycles of various streams for process. Cost economics of saving of water in distillery with typical case study. Importance of water conservation in distilleries

Air pollution: Air pollution control principles & equipments, Environmental Audit, Disposal of effluent & soil fertility, Environmental laws, Case studies.

Reference Books:

1. Biology of Microorganisms- T.D. Brock
 2. Introduction of Waste water treatment- R.S. Ramalho.
 3. Soil Biology & Ecology in India- C.A. Edwards & G.U. Veeresu,
Published by university of Agricultural Sciences, Hebbal, Bangalore,
 4. Environmental and Industrial Pollution control. Vol. I, R.K. Trivedi
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OR

M. Sc., PART-II (SEMESTAR-III)

Paper: XII-Instrumentation & Automation in Distillery.

UNIT – 01

[15]

Pressure, temperature measurement

Introduction to Instrumentation, important terms associated with instruments such as range, span, accuracy, error, resolution, accuracy, reproducibility, repeatability, and sensitivity

Pressure measurements

Various pressure units and their conversion, pressure transducers such as barometer, manometers, Bourdon tube, diaphragm, bellows, capsule, strain gauges for pressure measurement.

Temperature measurement

Various scales and conversion, Introduction to filled system thermometers, expansion thermometers, thermocouples, Resistance temperature detector, Thermistors and pyrometers.

UNIT – 02

[15]

Level and flow measurements

Level measurement

Direct methods such as gauge glass method, float method, magnetic level indicator, magnetic level switches, indirect methods such as hydrostatic method, radiation method, ultrasonic method and capacitance method.

Flow measurement

Basic terms such as total flow, volumetric flow, Mass flow, types of flow, flow transducers such as orifice plate, pitot tube, flow nozzle venturi meter, variable area flow meter, magnetic flow meter, coriolis mass flow meter, vortex flow meter, ultrasonic flow meter, turbine flow meter, displacement flow meter

UNIT – 03

[15]

Refractometry, Polarimetry:

Refractive index, Hand refractometer, Abbe's refractometer.

pH and conductivity measurement - Introduction, different types of sensors, pH meter and conductivity meter.

Polarimetry

Laurentz polarimeter, industrial polarimeter, white lamp single wedge/double wedge polarimeter, automatic polarimeter.
applications licationapps, Friction factor pump selection and.

UNIT – 04

[15]

Plant Automation:

Different systems used for automation, Details of PLC, SCADA and DCS monitoring systems, Benefits of automation

Reference Books:

1. Instrument Engineers handbook – Process measurement- B.G. Liptak
2. Process Instrumentation & Control- A. P. Kulkarni
3. Process Control Instrumentation Technology- C. D. Johnson.
4. Instrumental methods of analysis- Willard, Merrit & Dean

Syllabus of Practical Courses - M. Sc. II, Sem- III, Alcohol Technology

Alcohol Technology-III

1. Determination of Brix, Specific gravity & pH of the molasses.
2. Determination of moisture, total solid & suspended & ash content of molasses.
3. Determination of starch percent in Jawar.
4. Determination of starch percentage in Rice.
5. Determination of total fixed & volatile acidity of rectified spirit.
6. Fusel oil determination in Rectified spirit sample.
7. Determination of un-fermentable sugar in molasses sample.
8. Potassium Permanganate (KMnO_4) test for checking quality of spirit.

Microbiology:

1. Screening of antibiotics producing organism by crowded plate technique.
2. Screening of amylase producing organism by replica plate technique.
3. Determination of α - amylase activity from germinating seed.
4. Determination of specific activity of invertase Enzyme.
5. Bioassay of penicillin.
6. Estimation of Vitamin C by DCPIP method.
7. Production of alcohol from fruit juice & estimation by colorimetric method.
8. Capsule staining.
9. Determination of microbial contamination in alcohol.
10. Detection & isolation of pathogens from spoiled food.
11. Amylase production by using Bacillus species.

M. Sc., PART-II (SEMESTAR-IV)

Paper: XIII Alcohol & Beverages production from grain and other sources

UNIT – 01

[15]

Alcohol production from grain

Types of raw material used for alcoholic fermentation, main constituents of grain, selection of grain, grain quality & storage, grain processing, types of milling, wet milling process, liquification/mashing, factors affecting on mashing efficiency.

UNIT – 02

[15]

Alcoholic beverage: (Beer)

Beer manufacturing process, production of malt alcohol
Introduction, historical aspects of brewing, outline of the brewing process, malting, mashing, direct conversion of barley to wort, wort boiling and cooling, fermentation, beer treatments, beer properties, beer defects, the state of the industry, acknowledgements.

UNIT – 03

[15]

Table wines

Introductions, some economic aspects of history of wine making, grapes, must treatment, alcoholic fermentation, post fermentation operations, microbiological stabilization, sulphur dioxide addition, economic future.

UNIT – 04

[15]

Fruit & honey wines

Introduction, general information, raw materials, technological processing, honey wine (mead).

Reference Books:

1. Brewing yeast & fermentation – Chris Boulton & David Quain
 2. Concepts in Wine Technology – Yair Margalic
 3. Understanding Wine Technology
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M. Sc., PART-II (SEMESTAR-IV)

Paper: XIV- Production of ENA, ETHNOL &IMFL

UNIT - 01 [15]

Manufacturing of ENA from rectified spirit, details of process flow diagram, equipments required operation of plant.

UNIT – 02 [15]

Manufacturing of fuel alcohol, various process flow diagram, equipments required in each process, operation of plant

UNIT – 03 [15]

Production of IMFL (Whisky, Rum, Gin, & vodka)

Whisky

Introduction, history of whisky production, outline of the whisky producing process, individual operations, organoleptically important components of whisky, World-wide production of whiskies, .

Rum

Introduction, production of rum, aroma compounds of rum & their formation, conclusion

Gin & Vodka

Introduction, production of spirit for gin & vodka, botanicals, production of gin & vodka, composition of spirit, gin & vodka, finishing & bottling,

UNIT – 04 [15]

Manufacturing of the country liquor, detailed process, equipment process, bottling process, various brands of market

Reference Books:

1. Distillation – H. C. Barron
 2. Principle of fermentation technology – S. J. Hall
 3. Whisky Technology production & Marketing – Tang & Rus.
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M.Sc. PART-II (SEMESTAR-IV)
Paper: XV-CHEMICAL ENGINEERING
(Heat & Momentum Transfer)

UNIT - 01

[15]

Heat transfer

1.1 **Conduction**- Mechanism of heat transfer by conduction in solids, Fourier's law of heat transfer, thermal conductivity, and heat loss in conduction. Thermal insulation and optimum thickness for insulation.

1.2 **Convection**- Heat transfer by convection, forced and natural convection, individual and overall heat transfer coefficient. Fouling factor, overall resistance Effect of drop wise and film wise condensation, Effect of non-condensable gases.

1.3 **Radiation**-Heat transfer by radiation. Kirchhoff's law, Stefan-Boltzmann law

UNIT - 02

[15]

Heat transfer equipment

2.1 **Heater** - multi-pass shell and tube type heat exchanger-shell, tubes, tube pitch ligaments' (clearance), tube passes, baffles.

2.2 **Condenser** - types of condenser co-current & counter current.

2.3 Derivation of overall heat transfer coefficient from hot fluid to cold fluid through metal wall

UNIT - 03

[15]

Fluid Transfer

3.1 **Fluid statics** - Concept of momentum transfer, nature of fluid and pressure concept, variation of pressure with height- hydrostatic equilibrium. Barometric equation, measurement of fluid pressure manometer

3.2 Fluid flow –types of fluid's, viscosity of gases and liquids. Types of flow-laminar & turbulent, Reynolds number. Basic equation of fluid flow, average velocity, and mass velocity, conductivity equation, flow of incompressible fluids. Laminar flow through circular circuit, turbulent flow through pipes, friction factor

UNIT - 04

[15]

Fluid transfer equipments

Pumps-positive displacement and centrifugal pumps, fans, compressor and blower. Metering of fluids- pipes, fitting and valves, measurement of liquid and gas flow rates by orifice meter, venturi meter, rotameter and Pilot tube

Reference Books:

1. Unit operations & Unit Processes- C.M. Narayanan, B. C. Bhattacharya.
 2. Unit operations I & II (Heat & Mass Transfer) – K. A. Gavhane
 3. Chemical Engineering (Heat Transfer & fluid flow)- J.M. Coulsion
 4. Unit operations & chemical engineering – P. Chattopadhyay.
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ELECTIVE SUBJECTS**M. Sc., PART-II (SEMESTAR-IV)****Paper: XVI- General Engineering****UNIT – 01****[15]**

Water quality- surface water, ground water, hard water, industrial water, drinking water, domestic water. Treatments of water -Drinking: screening or pre sedimentation, coagulation, flocculation, sedimentation, filtration & disinfection. Hard ground water- aeration softening, filtration, chlorination, disinfection. Industrial water (boiler and cooling):D. M. water, water softening, reverse osmosis, processing for TDS- membrane, distillation, freezing.

UNIT – 02**[15]**

Pumps - centrifugal pumps, Bernoulli's theorem, understanding of head, BHP, NPSH, impellers, other components, total suction head, total discharge head & efficiency of pumps. Valves- different type of valves, gate, ball, diaphragm, check, non return globe, butter fly plug, needle and safety/relief valves etc. valve function & basic parts of valve.

UNIT – 03**[15]**

Heat exchanger unit- shell and tube heat exchanger, condenser (vertical & horizontal), Re-boilers, Plate type heat exchanger, Evaporation- natural circulation, forced circulation, agitated film type Evaporator type -1. single, double & multiple, 2. long tube rising or falling film, conventional Robert, 3. forward feed, backward feed, mixed feed, parallel feed etc.

UNIT – 04**[15]**

Steam generation system Use of steam, properties of steam, boiler and its components, type of boiler ,fire tube water tube, packed FBC ,furnace its type, stoke fire, spreader stoker, travelling grate stoker. Boiler blows down method its benefits. Boiler feed water treatments, internal & external treatment.

Reference Books:

1. Pumps & piping hand book, Igor J.
2. Chemical engineering volume 1st & 2nd, J.M. Coulson.
3. Hand book of sugarcane engineering

OR

M. Sc., PART-II (SEMESTAR-IV)

Paper: XVI POLLUTION PREVENTION & CONTROL

UNIT - 01

[15]

- ✓ Importance of environments.
- ✓ Biosphere and layers of atmosphere.
- ✓ Hydrological & nutrient cycles
- ✓ Types of pollution, damages from environmental pollution.
- ✓ Need of environmental legislations and environmental acts.
- ✓ Function of state & central pollution control boards.

UNIT - 02

[15]

- Source, classification and characterization of waste water.
- ✓ Physical & chemical characteristics of waste.
- ✓ BOD, COD and their importance
- ✓ Types of water pollution and their effects.
- ✓ Sampling and method of analysis.

UNIT - 03

[15]

- ✓ Preliminary, primary, secondary & tertiary treatments of waste water,
- ✓ Sludge treatments and disposal.
- ✓ Advance waste water treatments.
- ✓ Recovery of material from process effluents.
- ✓ Application to industries.
- ✓ Norms and standards of treated water,

UNIT - 04

[15]

- ✓ Air pollution-classification and source of air pollution. Air quality criteria and standards effects of air pollution on health, vegetation and material. Air pollution control methods, equipments used in industries.

- ✓ Solid waste treatments-origin ,classification and microbiology, properties and their variation .engineering system for solid waste management's. Generation, Handling, storage collection ,transport compositing and land filling.
- ✓ Noise pollution-source and determination of level .noise control criteria and noise exposure index administrative and engineering control, Acoustic absorptive material

Reference Books:

1. Environmental Pollution Control Engineering - C.S. Rao
2. Pollution Control in Process Industries - S.P. Mahajan,
3. Introduction to Environmental Engineering - Davis
4. Waste Water Engineering Treatment Disposal Reuse - Metcalf & Eddy
5. Environmental Engineering - G.N. Pandey and G.C. Carney
6. Industrial pollution – Technologies for Abatement and Control – R N Mukherjea, et al
7. Hand Book of Waste Management in Sugar Mills and Distilleries – Ashwani Kumar

OR

M. Sc., PART-II (SEMESTAR-IV)

Paper: XVI Business management & marketing

UNIT -01

[15]

- 1.1) 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.
- 1.2) 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.

UNIT - 02

[15]

- Manufacturing cost
Raw material cost, harvesting & transport cost, repairing and maintenance cost, chemical cost, store consumption cost, packing cost, selling cost, distribution & adm. . . Expenses. Audit system.
- Financial cost
Promoters contribution, Govt. contribution, loans from bank, Govt. subsidy, tax credit and refunds, working capital. Managements – need, sources and determinants

UNIT - 03

[15]

- Statutory laws applicable to sugar & allied industries
- ✓ Essential commodities acts-1955.
- ✓ Sugar control order -1966.
- ✓ Sugar cane control order -1966.
- ✓ Levy sugar supply order-1979
- ✓ Sugar packing and marking 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.
- Labor acts
- ✓ Grade & scale fixations wage board laws.
- ✓ Gratuity laws.
- ✓ Provident laws.
- ✓ Bonus acts.
- ✓ Factory acts.
- ✓ Service tax acts.
- 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,

UNIT -04

[15]

- 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.
- Global & domestic scenario of sugar.
- ✓ Global production & consumption, domestic production & consumption.
- ✓ Indian sugar standard, handling and storing of sugar

Reference book-

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

Syllabus of Practical Courses - M. Sc. II, Sem- IV, Alcohol Technology

IN PLANT TRAINING-I

a) Introduction:

Factory- Organization structure, Function of all departments, No. of employees in each department, detail flow chart of distillery unit.

b) Fermentation section: Equipment used for weighing of molasses. Dilution of molasses, TRS of molasses, fermentation processes used, type of fermentor, capacity of fermenter, fermentable sugar % in molasses contamination of molasses, use of yeast in both cascade/biostill continuous fermentation. Quantity of fresh used, recycle of spent wash for reduction of fresh water effect of recycling of spent wash on quality of alcohol.

c) Distillation section: Details of equipments used for distillation, specification of equipments, detail of process used for distillation. Process for production of ENA, process of production of ethanol. Process for production of country liquor, process for production of carbon dioxide

IN PLANT TRAINING-II

e) Effluent treatment plant: Quantity of effluent produced, process used for treatment, flow diagram of process, quality of effluent after treatment, disposal system.

f) Student need to visit all above sections and prepared the detail project report of distillery unit which consist of fermentation. Station, Distillation Sections, ETP section. This report may include various instruments used for process control..

C) workshop/seminar: Group of students shall arrange workshop/seminar any topic of above 3 sections.

D) VIVA: Students have appeared for VIVA at the time of submission of the project.