INTEGRAL UNIVERSITY

LUCKNOW

SYLLABUS & EVALUATION SCHEME

B. TECH.

FOOD TECHNOLOGY

SEMESTER III

w.e.f. July 2016

(CBCS)

B. TECH. FOOD TECHNOLOGY
SEMESTER III

STUDY & EVALUATION SCHEME

2nd Year **Semester: III**

Sl. No	Course Category	Subject Code	Name of the Subject	Periods				Evaluation Scheme				Subject Total
								Sessional (CA)			End Sem. Exam. (ESE)	
				L	T	P	C	CT	TA	Total		
1.	DC	BE-231	Food Microbiology	2	1	0	**3**	25	15	40	60	100
2.	DC	BE-232	Food Engineering I	3	1	0	**4**	25	15	40	60	100
3.	DC	BE-233	Food Chemistry	2	1	0	**3**	25	15	40	60	100
4	DC	BE -234	Refrigeration and Cold Chain	2	1	0	**3**	25	15	40	60	100
5.	ESA	BM-229	Principles of Management, Industrial Economics & IPR	2	1	0	**3**	25	15	40	60	100
6	ESA	MT - 203	Numerical & Statistical Analysis	2	1	0	**3**	25	15	40	60	100
7.	ESA	ES - 202/ CS-203	Disaster Management/ Cyber Law & Information Security	2	1	-	**3**	25	15	40	60	100
8.	HM	BM-226	Human Values & Professional Ethics	3	-	-	**	-	-	-	50*	50*
Practicals												
9.	ESA	ME-223	Fluid Mechanics Lab	0	0	4	**2**	30	30	60	40	100
10.	DC	BE-235	Food Chemistry Lab	0	0	4	**2**	30	30	60	40	100
11.	DC	BE-236	Food Microbiology lab	0	0	2	**1**	30	30	60	40	100
	Total			18	7	10	**27**	265	195	**460**	**540**	**1000**

** A non-credit foundation course. Candidate has to pass the course by securing at least 50 % marks up to fourth semester

L – Lecture **T** – Tutorial **P** – Practical **C** – Credits **CT** – Class Test **TA** – Teacher Assessment

Sessional Total (CA) = Class Test + Teacher Assessment

Subject Total = Sessional Total (CA) + End Semester Examination (ESE)

BS – Basic Sciences**, DC** – Departmental Core, **HM** – Humanities, **OE** – Open Elective, **DE** – Departmental Elective,
ESA – Engineering Sciences & Arts (Foundation Course & Engineering Courses)

FOOD MICROBIOLOGY
(BE-231)
(w.e.f. July 2016)

L T P C
2 1 0 3

Unit 1

Introduction to microbiology: definition, history of microbiology. Basic knowledge of microorganisms: Bacteria, fungi, actinomycetes, protozoa etc. prokaryotic and eukaryotic cells.

Unit 2

Microbial media and types, microbial isolation techniques: dilution, pour plate and streak plate. Microbial growth curve and growth measurements, pure culture, starter culture, cultural characteristics of bacteria.

Unit 3

Intrinsic (pH, moisture content, redox potential, nutrient content, antimicrobial constituents and biological structures) and extrinsic factors (temp., RH, presence and concentration of gases) governing growth of microorganisms in food.

Unit 4

Microbial spoilage of Food Products: Microbiology of raw milk and fermented milk products viz yoghurt, cheese, fruits and vegetable, meat and meat product, egg and fish.

Unit 5

Microbial foodborne diseases: introduction and types (foodborne intoxications and foodborne infections), Toxins produced by Staphylococcus, Clostridium, Aspergillus.

Book References:

1. Pelezar, M. J., Chan, E. G. S. and Krieg, N.R. (2002). , *Microbiology 5th edition*, Tata McGraw Hill and Co, New Delhi.

2. Frazier, W. C. & Westhoff, D. C. (1996). *Food Microbiology*, Tata McGraw Hill and Co.

3. N. Shakuntala Manay & M Shadakshra Swamy; revised edition,New age International publisher.

FOOD ENGINEERING-I
(BE-232)
(w.e.f. July 2016)

L T P C
3 1 0 4

Unit 1 **[8]**

Properties of fluids, Flow rate and pressure drop relationships for Newtonian fluids flowing through pipe, Characteristics of Non-Newtonian fluids - generalized viscosity coefficient and Reynolds number, Flow of compressible fluid, Flow measurement, Pumps and compressors.

Unit 2 **[8]**

Principle of Mass Transfer, Diffusion, Molecular diffusion in fluids, diffusivity of fluids, mass transfer co-efficient in laminar flow of effective diffusivity. Rheology of solid foods.

Unit 3 **[8]**

Extraction-Liquid-liquid extraction, selectivity & choice of solvent, liquid-liquid extraction equipment, Leaching-Introduction, leaching equipment, Principles of continuous-counter current leaching, Absorption - packings & packed tower, Basic principle of absorption, desorption or stripping.

Unit 4 **[8]**

Distillation –Vapour liquid equilibrium, relative volatility, flash & batch distillation, steam distillation, vacuum distillation, azeotrophic mixtures, distillation tower. Principle of humidification & dehumidification, humidity chart, wet and dry bulb temperature & cooling tower.

Unit 5 **[8]**

Filtration-principle of filtration; types of filtration. Equipment- filter press, rotary drum, shell & leaf filter, vacuum filter, centrifugal filter, filter media, filter aid, filter cake. Ultrafiltration, membrane filtration, reverse osmosis

Book References:

1. Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990. Food Engineering Operations. Elsevier.
2. Fellows P. (1988).Food Processing Technology: Principle and Practice. VCH Publ.
3. McCabe WL & Smith JC. (1999). Unit Operations of Chemical Engineering. McGraw Hill.
4. Sahay KM & Singh KK. (1994). Unit Operation of Agricultural Processing. Vikas Publ. House.
5. Singh RP and Heldman DR. (1993). Introduction to Food Engineering. Academic Press.

FOOD CHEMISTRY
(BE-233)
(w.e.f. July 2016)

L T P C
2 1 0 3

Unit-1

Introduction; Definition of food chemistry. Water; structure of water, water solute interactions, water activity, moisture sorption isotherms.

Unit-2

Carbohydrates- Monosaccharide's, monosaccharide isomerization and reactions, Oligo saccharides- lactose, maltose, sucrose; Polysaccharides, their solubility, gel formation and hydrolysis. Starch-structure, retro-gradation and gelatinization. Structure and functional properties of Gums, pectin, cellulose, dietary fibre.

Unit-3

Protein- structure, denaturation, functional properties, viscosity, protein quality and digestibility. Enzymes- types and chemical nature, factors influencing enzyme action, enzyme inactivation, coenzymes. Uses of enzymes in food processing. Browning and its control.

Unit-4

Fats- Classification and structure of fats and fatty acids, rancidity of fats, refining, hydrogenation and inter-esterification of fats. Safety of hydrogenated fats, consumption trends and nutritional aspects of fats.

Unit-5

Minerals and Vitamins: Sources and structures of minerals & vitamins; Effect of processing and storage of vitamins. Food Pigments: Importance, types and sources of pigments - their changes during processing and storages.

Book References:

1. Essentials of Food & Nutrition by Swaminathan, Vol. 1 & 2
2. Food Chemistry by L. H. Muyer
3. Hand Book of Analysis of fruits & vegetables by S. Ranganna
4. Fennema, O. R., Damodaran, S. (2008). Food Chemistry, 4th Edn. CRC Press USA

REFRIGERATION AND COLD CHAIN
(BE-234)
(w.e.f. July 2016)

L T P C
2 1 0 3

Unit-1 **[8]**

Definition of refrigeration and air conditioning, necessity of refrigeration and air conditioning. History of refrigerants, Refrigerants, definition, classification, nomenclature, methane and ethane series.

Unit-2 **[8]**

Desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical. Azeotropes. Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve. Ice manufacture, principles of ice production, different systems. Treatment of water for making ice, Brines, Freezing tanks, ice cans, air agitation, quality of ice.

Unit-3 **[8]**

Applications of refrigeration in different food products – fruit and vegetable products, meat products, fish, poultry products, dairy products etc.

Unit-4 **[8]**

Food Freezing: Freezing systems: indirect contact systems, plate freezers, air blast freezers, and freezers for liquid foods. Direct contact systems, air blast immersion, frozen food properties, density, Thermal conductivity enthalpy, apparent specific heat and thermal diffusivity, freezing time, factors influencing freezing time, freezing rate, thawing time.

Book References:

1. Arora CP, Refrigeration and air conditioning , Tata Mcgraw Hill.
2. Manohar Prasad, Refrigeration and air conditioning , New Age Publication.
3. Singh RP and Heldman DR.1993, 2003, 2009. Introduction to food engineering.Academic press 2nd, 3rd and 4th edition.
4. Fellow P. 1988 Food processing technology. VCH Ellis Horwood
5. Andrew D. Althouse, Carl H. Turnquist, Alfred F. Bracciano. Modern Refrigeration and Air Conditioning. Goodheart-Willcox Co.

PRINCIPLES OF MANAGEMENT, INDUSTRIAL ECONOMICS & IPR
(BM-229)
(w.e.f. July 2016)

L T P C
2 1 0 3

Unit 1

Industrial Economics: Concept, Nature and significance; Demand and supply: Concept, Law; Elasticity of demand and supply; Theory of consumer behavior, Indifference curve analysis.

Unit 2

Money: Concepts, inflation and Deflation; Banking system in India: Commercial and Central banking-Structure and types.

Unit 3

Management: introduction, functions; Evaluation of Management thoughts; Human Behavior in organization: Perception, Personality development and interpersonal relationship.

Unit 4

Jurisprudential definitions and concepts of property, rights, duties and their correlation; History and evolution of IPR (patent, design, copyright and Geographical indication). Significance of IPR; Requirement of a patentable novelty: Obtaining patent; Invention step and prior art and state of art procedure; Issues related to IPR protection of software and database; IPR protection of life forms: biological products, International convention in IPR; Infringement or violation, remedies against infringement: civil and criminal. Indian Patent Act 1970 (amendment 2000); Major changes in Indian patent system as post TRIPS effects.

Unit 5

Biosafety: Safety guidelines of rDNA research; Containment facilities and its disposal; Radiation hazards; Safety concerns about transgenics: Environmental, Health, Economic. Bioethics: Introduction, necessity and limitation; Ethical conflicts in Biotechnology; Different paradigms of bioethics: National and International, Bioethics of genes; Bioethics in health care: Bioethical dilemmas in medical and surgical treatment; Legal implications in bioethics.

Book References:

1. Old and Primrose “Principles of Gene Manipulation”.
2. Keru M “Ethical Biotechnology”, Global Vision Publishing House.
3. IHUxley TH “Evolution and ethics”, Princeton University Press.

Numerical and Statistical Analysis
MT-203
(w.e.f. July 2016)

LTP C
2 1 0 3

Unit-1 **[7]**

Errors in numerical computations, numerical solution of algebraic and transcendental equations by Bisection method, Iteration method, Regula false method, Newton-Raphson's method.

Unit-2 **[9]**

Finite differences: forward and backward differences, properties of operators, factorial polynomials, Interpolation: Newton Gregory forward and backward interpolation formula. Interpolation formula for unequal intervals, divided differences formula, central interpolation formula: Bessel, Stirling and Laplace Everett's interpolation formulae.

Unit-3 **[7]**

Numerical differentiation, Numerical integration by Trapezoidal rule, Simpson's 1/3 rule, 3/8 rule, Boole's rule, Weddle's rule.

Unit-4 **[8]**

Probability: Classical and axiomatic definition of probability. Addition and Multiplication theorem of probability. Conditional probability. Probability distributions: Binomial distribution, Poisson distribution and Normal distribution.

Unit-5 **[9]**

Testing of Hypothesis: Statistical hypothesis, null and alternative hypothesis, simple and composite hypothesis, critical region, type I and II error, power of a test. Test of significance based on t, F and chi-square distribution. Basic concepts of Simple random sampling and Stratified random sampling. Analysis of variance (ANOVA): One-way and two way classification.

Book References:

1. Text book of Numerical Analysis: H.C. Saxena (S. Chand Publication)
2. Numerical Analysis: S. S., Shastri/ B.S. Grewal/ A.R. Vashistha.

5.Q.S Ahmad, V. Ismail and S.A Khan: Biostatistics, laxmi Publications Pvt.Ltd.

6. S.C. Gupta and VK. Kapoor: Fundamental of Mathematical Statistics, S.C publication.

DISASTER MANAGEMENT
ES-202
(w.e.f.- July 2016)

L T P C
2 1 0 3

Objective:
The objective of this course is to familiarize the student with basic management principles relating to disaster management and mitigation techniques.

Units I **[8]**
Concept of disaster management. Types of disaster and their impact: Natural and Man- Made, Like- Earthquakes, Floods, Tsunami, Droughts, Cyclones, Avalanches, Forest Fire, Terrorism related Disaster etc. Assessment of human and Economic losses.

Units II **[8]**
Impact of extensive Industrialization. Impact of Global Warming and Environmental Degradation. National and global disasters.

Units III **[8]**
National policy for disaster Management, Elementary Knowledge of the Disaster Management Act 2005. Types of Responses: Central, State, District Level, Peoples Community participation in Disaster Management. Post-Disaster Management and Rehabilitation measures.

Unit IV **[8]**
Capacity Building for meeting disasters. Long term measures for preventions of disasters. Mitigation technique/strategies: Early warning systems, Data sharing at national and international level.

References:
1. Disaster management by Dr. V.K Sethi
2. The great Sumatra Earthquakes and Indian Ocean tsunami of December 2004- the effects of main land India and in the Andaman and Nicobar Island, published by IIT Kanpur.
3. Environmental managaenet by Dr. Shakeel Ahmad
4. Hazards, disasters and your community, ministry of home affairs.

CYBER LAW AND INFORMATION SECURITY

CS-203

(w.e.f.- January 2017)

L T P C
2 1 0 3

Unit1 **[8]**

Fundamentals of Cyber Law: Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout & design.

Unit 2 **[8]**

E - Commerce: Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, E-Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E-Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, Requirements of Digital Signature System.

Unit 3 **[8]**

Investigation and Ethics: Cyber Crime, Cyber jurisdiction, Cyber-crime and evidence act, Treatment of different countries of cyber-crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking. Internet security treats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Finger prints. Cyber-crime forensic: CASE STUDY in Cyber Crime.

Unit 4 **[8]**

Information security- Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.

Book References:

1. Harish Chander “Cyber Law and IT Protection”, PHI Publication, New Delhi
2. Merkov, Breithaupt “Information Security”, Pearson Education
3. “Cyber Law in India” - Farooq Ahmad-Pioneer books.
4. K. K. Singh, Akansha Singh “Information Security and Cyber law”, Umesh Publication, Delhi

HUMAN VALUES & PROFESSIONAL ETHICS

BM-226

Maximum Marks: 50
External Assessment: 50

L	T	P	C
3	0	0	0

Unit-1 **[6]**

Human Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self Exploration - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly.

Unit-2 **[6]**

Introduction to Ethical Concept: Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law

Unit-3 **[6]**

Professional Responsibility: The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.

Unit-4 **[6]**

Engineers Ethics: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment.

Unit-5 **[6]**

Global Issues: A Glimpse of Life Stories: **Life story of Prophet Mohammad**, Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs.
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership

Reference Readings:

Text Book

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://www.uptu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*
6. The Hundred, Michael Hart

FLUID MECHANICS LAB

ME -223

(Say minimum 8 experiments out of the following)

(w.e.f.- July 2016)

L	T	P	C
0	0	4	2

1. To verify Bernoulli's equation experimentally.
2. To calibrate a venturimeter meter and study the variation of coefficient of discharge with Reynolds number.
3. To calibrate an orifice and study the variation of coefficient of discharge with Reynolds number.
4. To study the velocity distribution in a pipe.
5. To study the transition, from laminar to turbulent flow and determine the lower critical Reynolds number.
6. To study the variation of friction factor for turbulent flow in smooth commercial pipes.
7. To verify impulse momentum equation experimentally and compare the force exerted by the jet on different shapes of vanes. (flat, hemispherical).
8. To determine experimentally the metacentric height of a ship model.
9. To plot the flow net for a given model with the help of Heleshwaw apparatus.
10. To determine the coefficient of discharge of an orifice of a given shape. Also determine the coefficient of velocity and coefficient of contraction of the orifice.
11. To calibrate a given v-notch or a rectangular notch and determine the coefficient of discharge

FOOD CHEMISTRY LAB
(BE-235)
(w.e.f. July 2016)

LTP C
0 0 4 2

1. Determination of moisture content.

2. Detection of reducing sugar by Fehling and Benedict test.

3. Determination of fat content of a food sample.

4. Detection of amino acid, protein and peptides by Ninhydrin test.

5. Determination of protein.

6. Determination of titrable acidity.

7. Determination of Ash content.

8. Detection of presence of starch by Iodine test.

9. Determination of water activity of different food materials.

10. Determine the vitamin C content of any fruit.

FOOD MICROBIOLOGY LAB

(BE-236)

(w.e.f. July 2016)

L T P C
0 0 2 1

1. Introduction to microbiological instruments and their working principle (Autoclave, air laminar flow, incubator, Hot air oven and Microscopes)

2. Preparation of media NAM (Nutrient agar medium) and PDA (potato dextrose agar) and glass ware sterilization by autoclave.

3. Isolate the microorganisms (bacteria and fungi) from air by plate exposure method.

4. Isolate microorganism (bacteria & fungi) from soil by spread plate method by using dilution technique.

5. Differentiate bacteria by gram-staining technique.

6. Endospore staining.

7. Detection and enumeration of spoilage microorganisms (Psychrotrophic count and proteolytic count)

8. Isolate the fecal coliform from sewage water and determine the MPN (Most probable no.) of sample.

9. Determine the quality of milk by using methylene blue reduction test (MBRT).