

SWAMI VIVEKANAND UNIVERSITY, SIRONJ SAGAR (M.P.)



SYLLABUS

For

**BACHELOR OF TECHNOLOGY (B.Tech)
FIRE & SAFETY ENGINEERING**

Course Code : BTFS

Department of Fire & Safety Engineering

Faculty of Engineering

Duration of Course	: 4 Years
Examination Mode	: Semester
Examination System	: Grading

Swami Vivekanand University, Sironja Sagar (M.P.)
2014-2015



Mathematics - I (BTFS-0101)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(g)		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(h) = (e+f)		(i) = (d+h)		
BTF S-	Mathematics - I	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I

Marks :16

MATRICES Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties of eigen values – Caley – Hamilton theorem – Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT – II

Marks :16

DIFFERENTIAL CALCULUS Curvature – Cartesian and polar coordinates – Circle of curvature – Involutives and Evolutives – Envelopes – Properties of envelopes.

UNIT – III

Marks :16

FUNCTIONS OF SEVERAL VARIABLES Function of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangean Multiplier method – Jacobians

UNIT – IV

Marks :16

ORDINARY DIFFERENTIAL EQUATIONS Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form

UNIT – V

Marks :16

THREE DIMENSIONAL ANALYTICAL GEOMETRY Direction cosines and ratios – Angle between two lines – Equation of a plane – Equation of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal spheres.

Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition.,
2. Dr.V.Ramamurthy & Dr. Sundarammal Kesavan," Engineering Mathematics" – Vol I & II Anuradha Publications, Revised Edition 2006.
3. Veerajan, T., Engineering Mathematics, Tata McGraw Hill Publishing Co., New Delhi,2000.

Reference Books

1. Kreyszig,E, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons. Singapore,2001.
2. Kandasamy P etal. "Engineering Mathematics", Vol.I (4th revised edition), S.Chand &Co., New Delhi,2000.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "Advanced Mathematics for Engineering students", Volume I (2nd edition), S.Viswanathan Printers and Publishers, 1992.



Fundamentals of Physics (BTFS-0102)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total (d) = (a+c)	Practical		TW (g)	Total (h) = (e+f)		
		L	T	P	C	Max	Min			Max	Min				
		(a)	(b)	(c)	(e)	(f)	(i) = (d+h)								
BTFS-0102	Fundamentals of Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

WAVE OPTICS-I Interference- definition, types, explanation of interference, Interference by division of wave front: Fresnel's biprism, fringe width, Interference in thin films Wedge shaped films, Interference by division of amplitude: Newton's rings, Michelson's Interferometer and its applications.

UNIT – II

Marks :16

WAVE OPTICS-II Diffraction :- Introduction - Differences between Fresnel and Fraunhofer diffractions Single slit diffraction (Qualitative and quantitative treatment) – Differences between interference and diffraction, resolving power of optical instruments (prism and grating). Polarization:- Introduction – double refraction –Negative crystals & Positive crystals - Nicol's prism – Quarter wave plate and half wave plate – Production and detection of circularly and elliptically polarised light.

UNIT – III

Marks :16

QUANTUM PHYSICS De Broglie's hypothesis, De Broglie's wave length, Davisson and Germer's experiment, Compton Effect, concept of wave packet & their properties, wave function & probability interpretation, Heisenberg's Uncertainty Principle, its elementary proof and applications, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Application of time independent Schrödinger wave equation to particle trapped in a one dimensional square potential well.

UNIT – IV

Marks :16

NUCLEAR PHYSICS

General properties of nucleus, Nuclear model (liquid drop model and shell model), accelerator, linear particle accelerator, cyclotron, general betatron, Counters and particle detectors Geiger-Muller Counter, nuclear fission, nuclear fusion, nuclear reaction, nuclear reactors.

UNIT – V

Marks :16

LASER AND FIBER OPTICS

Laser: Stimulated and spontaneous processes, main part of laser, laser action population inversion, pumping, Optical resonators, characteristics of laser beam, Principles and working of Ruby, Nd:YAG, He-Ne & with energy level diagram and Applications of lasers Fiber Optics - Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses, various uses, and application of optical fibers.



Text Books

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"

Reference Books

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Jenkins and White: "Optics", McGraw-Hill Book Company.
4. Sanjeev Puri: Modern Physics, Narosa Pub.Co. 2004.
5. Kaplan: Nuclear Physics, Narosa Publishing, 1987.
6. Tyagrajan and Ghatak: Lasers, Macmillan, 2001.

List of Experiments

1. Keiser: G Optical fiber Communication, McGraw-Hill, 2000.
2. Fresnel Biprism,
3. Newton's Rings,
4. Michelson's Interferometer.
5. Resolving Powers –Telescope,
6. Spectrometers-R.I., Wavelength, using prism and grating
7. Optical polarization based experiments: Brewster's angle, polarimeter etc.
8. Measurements of wavelength of LASER
9. To study the CRO.
10. Charging and discharging of capacitor
11. Other conceptual experiments related to theory syllabus



Chemistry (BTFS-0103)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) =		
						(a)	(b)			(c)	(d) = (a+c)		(e)	(f)	
BTFS-0103	Chemistry	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

TECHNOLOGY OF WATER

Source of water, Impurities in water, Analysis of water- Hardness of water, Estimation of Hardness, Alkalinity of water, Determination of alkalinity, Disadvantages of using hard water in boiler- sludge and scale formation, Boiler corrosion, Water softening techniques (Internal and External treatment), treatment of water for domestic purposes.

UNIT – II

Marks :16

CORROSION AND ITS CONTROL

Corrosion: Basic concept- Principles, Mechanism of Dry or Chemical Corrosion and Wet or Electrochemical Corrosion, Pilling Bedworth rule, Types of corrosion- Galvanic corrosion, Concentration cell corrosion, Pitting corrosion, Stress corrosion, Microbiological corrosion, Factors influencing corrosion, Corrosion control.

UNIT – III

Marks :16

A. FUELS

Definition & Classification of fuels, Calorific values, Analysis of coal, Carbonization of coal, Manufacturing of coke & recovery of by products. Cracking, Knocking, Anti-knock, Octane & Cetane number, Gaseous fuels.

B. LUBRICANTS

Introduction, functions & classification of lubricants, Mechanism of lubrication, Properties and Testing of lubricants.

UNIT – IV

Marks :16

POLYMER

Introduction and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization, Mechanism of addition polymerization -Free radical and Ionic polymerization, Ziegler Natta polymerization, Vulcanization of rubbers, Preparation, Properties and Applications of important polymers- Polyethylene, PVC, PMMA, Nylons, Terylene, Glyptal, Bakelite, Urea-formaldehyde, Silicone resin, Neoprene, Buna S, Buna N.

UNIT – V

Marks :16

INSTRUMENTATIONAL METHODS OF CHEMICAL ANALYSIS

Introduction to Spectroscopy, Electromagnetic spectrum, Introduction, Principle, Instrumentation and Application of IR, UV- Visible, NMR, Basic Principle and Instrumentation of Potentiometry, Flame photometry and Chromatography.



Text Books

1. Jain.P.C and Monika Jain, Engineering Chemistry, Danpat Raj publishing company (P) Ltd, New Delhi – 2002.
2. Dara.S.S, Text book of Engineering Chemistry, S. Chand & Company Ltd, New Delhi
3. Sharma B.K., “Instrumental methods of chemical analysis” 24th Edition Krishna Prakashan Media Pvt. Ltd, Meerut, 2005.

Reference Books

1. Kuriacose J.C. and Rajaram J. Chemistry in Engineering and Technology, Volume II, Tata McGraw Hill p.b. Co., 1988.
2. Jeyalakshmi.R & Ramar. P, Engineering Chemistry, 1st Edition, Devi Publications, Chennai 2006.
3. Rattan S., Text book of Engineering Chemistry, S.K. Kataria and Sons, Publication, 1st Edition, New Delhi, 2012

List of Experiments

1. Preparation of standard solutions.
2. Conductometric titration-determination of strength of an acid.
3. Determination of alkalinity, hydroxyl, carbonate and bicarbonate in water.
4. Determination of total hardness in water using EDTA titrations.
5. Estimation of iron by potentiometer.
6. Estimation of Copper in Ore
7. Determination of viscosity of lubricating oil with change of temperature by
 - a. Red Wood Viscometer Number 1
 - b. Red Wood Viscometer Number 2
8. Determination of Flash and Fire point of liquid fuel and lubricants by
 - a. Cleaveland’s Open Cup Method
 - b. Abel’s Flash Point Apparatus
 - c. Pensky Martin’s Flash Point Apparatus.
9. Determination of Cloud and Pour point of lubricants by Cloud and Pour point Apparatus.
10. Determination of carbon residue of lubricants by Conradson’s Apparatus.

REFERENCE BOOKS FOR PRACTICAL

1. Chemistry department manual, Edition, 2008.
2. Chawla S., Theory and Practicals of Engineering Chemistry, Dhanpat Rai & Co. (Pvt.) Ltd. 6th Edition, New Delhi – 2011.



Basic Engg.- I (BTFS-0104)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) =		
						(a)	(b)			(c)	(d) = (a+c)		(e)	(f)	(g)
BTFS-0104	Basic Engg.- I	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchhoff's law. Average and RMS values, concept of phasor representation, RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values.

UNIT – II

Marks :16

MAGNETIC CIRCUITS

Definition of mmf, flux and reluctance, leakage flux, fringing, magnetic materials and B-H relationship. Problems involving simple magnetic circuits. Faraday's laws, induced emfs and inductances, brief idea on Hysteresis and eddy currents.

UNIT – III

Marks :16

ELECTRICAL MACHINES

Working principle, construction and applications of DC machines and AC machines (single phase transformers, single phase induction motors – split phase, capacitor start and capacitor start & run motors).

UNIT – IV

Marks :16

DIGITAL ELECTRONICS

– Number system, Boolean Theorems, DeMorgan's Theorem, Logic gates, Implementation of Boolean expression using logic gates, Half adder, Full adder. Electronic Components – Resistors, Inductors and Capacitors and their types. CRO.

UNIT – V

Marks :16

SEMICONDUCTOR – Energy band diagram, Intrinsic and Extrinsic semi conductors, PN Junction diode, Zener diode and their V-I characteristics, Zener diode used as a Voltage regulator, Light emitting diode and Photo diode. Rectifier – Half wave and full wave Rectifier and their efficiency and ripple factor, Filters.



Text Books

1. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
2. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
3. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
4. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
5. Mehta V.K., Principals of Electronics, S. Chand & Co.
6. Moris Mano, Digital Electronics, PHI Pub.
7. Kalsi H.s. , Electronics Instrumentation, ISTE Pub.

Reference Books

1. Kothari D. P and Nagrath IJ, Basic Electrical Engineering, Tata McGraw- Hill, 1991.
2. Thomas L.Floyd Electronic devices, Addison Wesley Longman (Singapore) Pvt . Ltd., 5th Edition.
3. Nagrath & Kothari, Basic Electrical Engineering, III Edition TMH.
4. Mehta V.K., Principals of Electronics, S. Chand & Co.

List of Experiments

1. Study of KVL and KCL.
2. Study of Transformer, name plate rating, determination of ratio and polarity.
3. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
4. Identification and testing of different Electronics components.
5. Observing input and output waveforms of rectifiers.
6. Verification of truth table for various gates.
7. To study the V-I characteristics of PN diode and Zener Diode.
8. To implement basic logic gate by using universal gate(NAND & NOR).
9. Measurement of frequency and time period of a signal using CRO.



Computer Lab (BTFS-0105)

Course Code	Title of the paper	Period Per Week				Distribution of Marks							Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW		
		L	T	P	C	Max	Min			Max	Min		(h) =	
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(e+f)	(d+h)		
BTFS-0105	Computer Lab	-	-	2	2	-	-	-	-	-	-	50	50	50

PURPOSE

This Lab Course will enable the students to understand the basics of computer and to know the basics of MSOffice.

INSTRUCTIONAL OBJECTIVES

1. To learn the basics of computer, Computer Peripherals and its application in real world.
2. Demonstration on Ms-Word, Ms-Excel, Ms-Power Point and Ms-Access

Text Books

1. Introduction to Information Technology ITL Education Solutions Ltd., Pearson 2nd Edition, 2006.

List of Experiments

1. Study experiment on evolution of computer programming languages.
2. Suggest some of the Network Topologies that can be incorporated in your campus. Justify your choice.
3. Experiments to demonstrate directory creation and file creation.
4. Create a document with all formatting effects.
5. Create a document with tables.
6. Create labels in MS word.
7. Create a document to send mails using mail merge option.
8. Create an Excel File to analyze the student's performance. Create a chart for the above data to depict it diagrammatically.
9. Create Excel sheet to use built-in-function like sum, count, countif, if, etc.
10. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
11. Create a Power Point presentation for your personal profile with varying animation effects with timer.
12. Consider student information system which stores student personal data, mark information and non-academic details.
 - * Use MS Access to create Tables and execute SQL queries to do this following
 - * Display all student records.
 - * Display student details with respect to his identity.
 - * Delete some records from the table.
 - * Find total marks obtained by student in each list.



Workshop Practice (BTFS-0106)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) =		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(e+f)		(d+h)		
BTFS-0106	Workshop Practice	-	-	2	2	-	-	-	-	50	15	50	100	100	

PURPOSE

To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

INSTRUCTIONAL OBJECTIVES

To familiarize with

1. The basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy.
2. The production of simple models in the above trades.

Text Books

1. Gopal, T.V., Kumar, T., and Murali, G., A first course on workshop practice – Theory, practice and work book, Suma Publications, 2005.

Reference Books

1. Kannaiah, P. & Narayanan, K.C. Manual on Workshop Practice, Scitech Publications, Chennai, 1999.
2. Venkatachalapathy, V.S. , First year Engineering Workshop Practice, Ramalinga Publications, Madurai, 1999.

List of Experiments

1. EMPHASIS TO BE LAID ON REAL LIFE APPLICATIONS WHEN FRAMING THE EXERCISES.
2. FITTING
Tools & Equipments – Practice in Filing and Drilling.
Making Vee Joints, Square, dovetail joints, Key Making.
3. CARPENTRY
Tools and Equipments- Planning practice. Making Half Lap, dovetail, Mortise & Tenon joints, a mini model of a single door window frame.
4. SHEET METAL
Tools and equipments - Fabrication of a small cabinet, Rectangular Hopper, etc.
5. WELDING
Tools and equipments - Arc welding of butt joint, Lap Joint, Tee Fillet.
Demonstration of Gas welding, TIG & MIG.
6. SMITHY
Tools and Equipments – Making simple parts like hexagonal headed bolt, chisel.



English (BTFS-0107)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			(d) = (a+c)	Max		Min		
		(a)	(b)	(c)	(e)	(f)	(g)			(e+f)	(d+h)				
BTFS-0107	English	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I

Marks :16

LANGUAGES AND SKILLS OF COMMUNICATION

Linguistic Techniques, Reading Comprehension, Phonetic symbols/signs, Oral Presentation, Process of communication, Verbal and non-verbal Communication, Barriers of communication.

UNIT – II

Marks :16

APPLICATION OF LINGUISTIC ABILITY

Definitions of Engineering terms, objects, processes & principles ,Paragraph Writing on topics of General Interest, Importance of Listening Skills, Unseen Passage, Conversational Dialogues

UNIT – III

Marks :16

LETTER WRITING

Applications, Enquiry & Complaint letters, Calling & Sending quotations, Placing orders, Tenders.

UNIT – IV

Marks :16

PRECISE WRITING

Slogan – Writing, Technical Description of Simple engineering objects & processes, Note – making.

UNIT – V

Marks :16

REPORT WRITING

Observation Report, Survey Report, Report of Trouble, Laboratory Report, Project Report, Telephonic Etiquettes, Debate, Speech.

Text Books

1. Abraham Benjamin Samuel Practical Communication Communicative English LSRW2000 – SRMEC –June 2006 Revised Edition.
2. Staff of the Department of Humanities and Social Science, Anna University, “English for Engineers /Technologist Vol.-I”. Orient Longman, 1990.

Reference Books

1. Herbert. A. J. The structure of Technical English Orient Longman 1995.
2. Pickett and Laster, ‘Technical English, Writing, Reading and Speaking’, New York Harper and Row Publications, 1997.
3. Interactive course in phonetics and spoken English published by Acoustics Engineers (ACEN) 2002.



Project - I (BTFS-0108)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) = (e+f)		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(h) = (e+f)		(i) = (d+h)		
BTFS-0108	Project - I	-	-	4	4	-	-	-	-	-	-	50	50	50	

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
4. To adapt students for latest developments and to handle independently new situations.
5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

- i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
- ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty
- iii) At all the steps of the project, students must submit a written report of the same.



Mathematics - II (BTFS-0201)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) =		
		(a)	(b)	(c)	(a+c)	(e)	(f)			(g)	(e+f)		(d+h)		
BTFS-0201	Mathematics - II	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I

Marks :16

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

UNIT – II

Marks :16

Fourier Series: Introduction of Fourier series , Fourier series for Discontinuous functions, Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform.

UNIT – III

Marks :16

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method.

UNIT – IV

Marks :16

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation. Separation of variable method for the solution of wave and heat equations.

UNIT – V

Marks :16

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem.

Text Books

1. Grewal B.S, Higher Engg Maths, Khanna Publications, 38th Edition., Veerajan, T., Engineering

Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
2. Higher Engineering Mathematics by BS Grewal, Khanna Publication
3. Advance Engineering Mathematics by D.G.Guffy



Material Physics (BTFS-0202)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) = (e+f)		
						(a)	(b)				(c)			(d) = (a+c)	
BTFS-0202	Material Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

STRUCTURE OF MATERIALS

Type of solids, Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Bragg's law X-ray diffraction for crystal structure.

UNIT – II

Marks :16

SEMICONDUCTING MATERIALS

Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, carrier concentration in n type semiconductors, carrier concentration in p-type semiconductors, Hall effect and its applications - variation of carrier concentration with temperature, conductivity of extrinsic semiconductor, P-N junction – forward bias – reverse bias – V-I characteristics of a p-n junction. Basic introduction of transistors.

UNIT – III

Marks :16

DIELECTRIC MATERIALS

Introduction, Fundamental definitions, Local field, Clausius- Mossotti relation, different types of electric polarization (dipolar, ionic and electronic polarizations), frequency and temperature effects on polarization, dielectric loss, dielectric breakdown, determination of dielectric constant, properties and different types of insulating materials, ferroelectric materials, spontaneous polarization in BaTiO₃, electrets.

UNIT – IV

Marks :16

MAGNETIC & SUPERCONDUCTING MATERIALS

MAGNETIC MATERIALS Concept of magnetism- Dia, para, ferro magnetic materials · Hysteresis loop· Soft and hard magnetic material· magnetic Storages application of magnetic materials

SUPERCONDUCTING MATERIALS Introduction – basic theories for superconductivity Meissner effect - Properties of superconductors - Type-I and Type-II superconductors – High T_c superconductors – application.

UNIT – V

Marks :16

NANO MATERIALS

Introduction to nano science, nano materials synthesis of nano materials (using different routes) properties of nano materials, carbon nano tubes, application of nano materials.



Text Books

1. Gaur and Gupta "Engineering Physics"
2. Tiwari and Navneet Gupta "Engineering Physics"
3. Vikram Yadav "Engineering Physics"
4. Materials Science'. By Dr. M. Arumugam.

Reference Books

1. Beiser, "Modern Physics", McGraw-Hill Inc., New Delhi.
2. Avadhanulu and Kshirsagar "Engineering Physics".
3. Azroff: Solid State Physics, Tata McGraw-Hill, 2004.
4. Materials Science'. By Dr. M. Arumugam.
5. Science of Engg. Materials and Carbon Nano tubes- C. M. Shrivastava and C. Srinivasan

List of Experiments

1. Uses of Potentiometers and Bridges (Electrical)
2. Experiments connected with diodes
3. Experiments connected with transistor.
4. Measurement of energy band gap of semiconductor.
5. To study Hall effect.
6. To study Solar cell.
7. To study the LED
8. Other conceptual experiments related to theory syllabus.



Energy & Environment Science (BTFS-0203)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min				
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)	(g)							
BTFS-0203	Energy & Environment Science	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I

Marks :16

ENERGY

Energy, Energy scenario in world and India, Sources of energy, Renewable and nonrenewable sources of energy, Advantages and disadvantages of different sources of energy- Fossil fuel, Coal, Oil, Gas, Nuclear, Solar, Wind, Geothermal, Hydel, Hydrogen and Ocean energy.

UNIT – II

Marks :16

ENVIRONMENT AND ECOSYSTEM

Ecology and ecosystem, Structure and types of an ecosystem, Food chain and food web, segment of Environment-Atmosphere, Hydrosphere, Lithosphere, Biosphere, Cycles in ecosystem- Gaseous, Sedimentary and Water.

UNIT – III

Marks :16

ENVIRONMENTAL POLLUTION-I

Introduction, Air Pollution, Lapse Rate and Inversion Temperature, Air Pollutants, Classification of Air Pollutants, Causes of air pollution, Adverse effect of air pollution, Acid rain, Global warming, Chemical & photochemical smog and Ozone layer depletion, Control of Air Pollution.

UNIT – IV

Marks :16

ENVIRONMENTAL POLLUTION-II

Water Pollution, Classification of water pollutants, Characteristics of waste water, Waste water treatment- Primary, Secondary and Tertiary, Eutrophication, Soil or and Pollution, Radioactive Pollution, Noise Pollution

UNIT – V

Marks :16

ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

Solid waste management, Treatment and disposal methods, important environmental protection act in India- water, air (prevention and control of pollution) act, Wild life conservation and forest act, Functions of central and state pollution control boards, Environmental impact assessment.

Text Books

1. Sharma.B.K. and Kaur, Environmental Chemistry, Goel Publishing House, Meerut, 1994.
2. De A.K., Environmental Chemistry, New Age International Pvt. Ltd., New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, Essential of Environmental Studies, Pearson Education, 2004.

Reference Books

1. Dara S.S., A Text Book of Environmental Chemistry and pollution contro, S.Chand & Company Ltd., New Delhi, 2004.
2. Jeyalakshmi.R, Principles of Environmental Science, 1st Edition, Devi Publications, Chennai 2006.
3. Kamaraj.P & Arthanareeswari.M, Environmental Science – Challenges and Changes, 1st Edition,Sudhandhira Publications, 2007.



Basic Engg.- II (BTFS-0204)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) = (e+f)		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(h) = (e+f)		(i) = (d+h)		
BTFS-0204	Basic Engg.- II	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

Building Materials & Construction Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

UNIT – II

Marks :16

Surveying & Positioning:

Introduction to surveying Instruments – levels, theodolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.

UNIT – III

Marks :16

Engineering Mechanics

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems. Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia.

UNIT – IV

Marks :16

Measurement

Temperature, pressure, velocity, flow, strain, force and torque measurement, concept of measurement error & uncertainty analysis, measurement by Vernier caliper, micrometer, dial gauges, slip gauges, sine-bar and combination set; introduction to lath, drilling, milling and shaping machines.

UNIT – V

Marks :16

Reciprocating Machines

Thermodynamics: First and second law of thermodynamics; steam properties, steam processes at constant pressure, volume, enthalpy & entropy, Steam engines, hypothetical and actual indicator diagram; Carnot cycle and ideal efficiency; Otto and diesel cycles; working of two stroke & four stroke petrol & diesel IC engines.



Text Books

1. Raju K.V.B., Ravichandran P.T., Basics of Civil Engineering, Ayyappa Publications, Chennai, 2000.
2. Ramesh Babu, Civil Engineering, VRB Publishers, Chennai, 2000.
3. Kumar, T., Leenus Jesu Martin., and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai, 2007.
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.

Reference Books

1. Rangwala, S.C., Engineering Materials, Charotar Publishing House, Anand,
2. National Building Code of India, Part V, Building Materials, 2005
3. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi
4. Prabhu, T. J., Jai Ganesh, V., Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
5. Palanichamy, M.S., Basic Civil & Mechanical Engineering, Tata McGraw-Hill, New Delhi 1991.
6. Nagpal G. R., Power Plant Engineering, Khanna Publisher, Delhi, 2004



Computer Science (BTFS-0205)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			(d) =	Max		Min		
						(a)	(b)			(c)	(a+c)		(e)	(f)	
BTFS-0205	Computer Science	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I

Marks :16

PROGRAMMING FUNDAMENTALS

Computer Basics; Program Development Life Cycle: Flow Chart, Algorithm, Compilation and Execution; Introduction to C Language: program structure, variables, keywords, data types; Input / Output functions: scanf, printf; simple programs.

UNIT – II

Marks :16

DECISION AND LOOP CONTROL STRUCTURE

Logical operators; Decision statements: if/else, switch/case statements; Loop control statements – for, while, do/while.

UNIT – III

Marks :16

ARRAYS AND FUNCTIONS

Arrays: Introduction to arrays; One dimensional array: declaration, reading and printing array elements, sorting and searching. Functions: Definition; declaration of functions; return statement; recursion.

UNIT – IV

Marks :16

INTRODUCTION TO OOP CONCEPTS

OOP concepts: classes and objects, encapsulation, inheritance, overloading, polymorphism, constructor and destructor, data hiding, simple program in C++.

UNIT – V

Marks :16

INHERITANCE AND OVERLOADING

Inheritance – single, multiple, multilevel; Overloading – Function overloading, Operator overloading.

Text Books

1. Kanetkar P.Yashwant, “Let us C”, BPB publications, 2002.
2. Ashok N.Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
3. Herbert Schildt, “The Complete Reference C++”, TataMcGrawHill, 2001, 3rd Edition.
4. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.



Reference Books:-

1. Robert Lafore, "Object Oriented Programming in Microsoft C++", The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

List of Experiments:-

Note to the Instructors: Design exercise problems to demonstrate the use of C and C++ in the area of specialization.

1. Programs to demonstrate the use of scanf() and printf() functions
2. Programs to evaluate arithmetic expressions
3. Programs using conditional statements
4. Programs using for, while , do...while
5. Programs on arrays
6. Programs to perform matrix addition and multiplication
7. Programs to implement functions
8. Programs to illustrate recursion
9. Program to create classes and objects using C++
10. Program to implement Constructor and Destructor in C++
11. Program to implement single inheritance in C++
12. Program to implement Function overloading in C++
13. Program to implement Operator overloading in C++



Engg. Graphics Lab (BTFS-0206)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) =		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(e+f)		(i) = (d+h)		
BTFS-0206	Engg. Graphics Lab	-	-	2	2	-	-	-	-	50	15	50	100	100	

UNIT – I

FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

UNIT – II

PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

UNIT – III

SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

UNIT – IV

PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

UNIT – V

BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

Text Books

1. Jeyapoovan, T., Engineering Drawing and Graphics using AutoCAD 2000, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.

Reference Books

1. Bhatt, N.D., Elementary Engineering Drawing (First Angle Projection), Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. Engineering Drawing & Graphics, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. Engineering Drawing & Graphics, Private Publication, Chennai, 1990.



Seminar/GD/Lang. Lab (BTFS-0207)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min			Max	Min		(h) = (e+f)		
		(a)	(b)	(c)	(d) = (a+c)	(e)	(f)			(g)	(h) = (e+f)		(i) = (d+h)		
BTFS-0207	Seminar/GD/Lang. Lab	-	-	2	2	-	-	-	-	-	-	50	50	50	

UNIT – I

Topics to be covered in the Language Lab Sessions:

Introduction session: Introduce oneself, Family background, Educational qualification, Hobbies and interest, Expertise, Experience (If any), Strength and weaknesses.

UNIT – II

Body language: Importance of body language, Dressing sense, Walking sense, Talking and communication, Dining and eating sense.

UNIT – III

Telephonic etiquettes: How to receive calls, How to respond, How to make a call, Common expressions for calling.

PPTs presentations:

Improving speaking skills: Speech practices, Role plays (on stage), GD and Debate, Extempore speech, Word games, JAM (Just a minute) session, Describing objects and situations.

UNIT – IV

Reading skills: Improving reading skills, Paragraph reading, Storytelling and reading, Audio and video sessions.

UNIT – V

Writing skills: Paragraph writing, Word power/ vocabulary building, Article writing, Translations from Hindi to English and vice-versa.

Presentation skills: Oral presentations, on all the learning sessions. Seminar on given topics.



Project work-II (BTFS-0208)

Course Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total (d) = (a+c)	Practical		TW (g)	Total (h) = (e+f)		
		L	T	P	C	Max	Min			Max	Min				
						(a)	(b)			(c)	(e)			(f)	
BTFS-0208	Project work-II	-	-	4	4	-	-	-	-	-	50	50	50		

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.
4. To adapt students for latest developments and to handle independently new situations.
5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

- i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
- ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
- iii) At all the steps of the project, students must submit a written report of the same.



MATHEMATICS-III (BTFS-0301)

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0301	MATHEMATICS-III	3	1	0	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT- I

Marks : 16

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals.

UNIT- II

Marks : 16

Errors & Approximations, Solution of Algebraic & Transcendental Equations (Regula Falsi Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Seidel Iterative methods

UNIT- III

Marks : 16

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

UNIT- IV

Marks : 16

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

UNIT- V

Marks : 16

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis :Students t-test, Fisher's z-test, Chi-Square Method

Text Books:-

1.Engineering Mathematics by B.S.Grewal .

Reference Books:-

1. Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
- 2.Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
3. Mathematical Methods by KV Suryanarayan Rao, SCITECH Publication
4. Numerical Methods using Matlab by Yang, Wiley India
5. Probability and Statistics by Ravichandran ,Wiley India



CHEMICAL ENGINEERING-I (BTFS-0302)

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0302	CHEMICAL ENGINEERING-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Material Balance: Introduction to chemical engineering, basic chemical calculations-mole concept, methods of expressing composition mole fraction, weight fraction, volume fraction, concentration of liquid solutions- molarity, modality, normality, ppm. Ideal gases and gas mixtures-ideal gas law, Amagat's law, Dalton's law, Henry's law, average molecular weight, density of gases, partial pressure and partial volume calculations. Material balance in evolving chemical reactions and not in evolving chemical reactions, simple calculations involving cycle, by passes and purge streams.

UNIT-II

Marks : 16

Energy balance

Energy balance-heat capacity, specific heat and enthalpy, heat capacity of gases at constant pressure, heat Capacity of gaseous mixtures, latent heats, enthalpy changes accompanying chemical reactions standard heat of formation and standard heat of combustion, standard heat of reaction

UNIT-III

Marks : 16

Chemical Engineering Thermodynamics

Chemical thermodynamics, fundamental concepts and definitions-types of thermodynamic systems and properties-closed, open and isolated system-intensive and extensive properties-path and state functions, first law of thermodynamics, second law of thermodynamics, entropy, change in entropy, Maxwell relations, heat capacity in terms of entropy, equation of state of gases, the principle of corresponding states, compression and expansion of liquids-Joule Thomson expansion. Gibbs free energy change, equilibrium constant, effect of temperature on equilibrium constant.

UNIT-IV

Marks : 16

Mechanical operations

Solids: Properties of solids, methods of size analysis-differential and cumulative, screening, screening equipment, effectiveness of screens. Size reduction of solids, types of equipment-jaw crushers, gyratory crushers, hammer mills, ball mill, power requirement, laws of crushing. Handling of solids- principle of operation of belt conveyers, bucket elevators and pneumatic conveyers. Fluids: Flow of solids through fluids-maximum settling velocity.

UNIT-V

Marks : 16

Sedimentation-Laboratory batch sedimentation, calculation of area and depth for continuous thickeners. Principle of centrifugal separation. Filtration: equipments for filtration-plate and frame filter press, rotary drum filter, constant pressure and constant rate filtration, filter media, filter aids.



Text Books :-

1. W.L. McCabe, J.C. Smith & Peter Harriott, Unit Operations of Chemical Engineering, McGraw-Hill
2. K.V.Narayanan, Stoichiometry and Process Calculations, Prentice-Hall of India Pvt.Ltd.

Reference Books:-

1. W.L.Badger & J.T.Banchero, Introduction to Chemical Engineering, Tata McGraw-Hill
2. K.V.Narayanan, A Text Book of Chemical Engineering Thermodynamics, Prentice Hall India Pvt Ltd.
3. Christe J.Geankoplis, Transport Process and Unit Operations, Prentice Hall India Pvt Ltd

List of Experiments:-

1. Energy balance-heat capacity
2. Effect of temperature on equilibrium constant.
3. Study of screening equipment
4. Flow of solids through fluids-maximum settling velocity.
5. Filtration: equipments for filtration-plate and frame filter press



FS-0303 FLUID MECHANICS AND FLUID FLOW MACHINES

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0303	FLUID MECHANIS AND FLUID FLOW MACHINE	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT I

Marks : 16

Scope of fluid mechanics- Dimensions and units-Definition of fluid- Fluid properties-density, specific weight, pressure, viscosity, surface tension and capillarity, compressibility-Rheological Classification. Fluid Statics - Pressure at a point - Basic equation of fluid statics - Hydrostatic equations for Incompressible and compressible fluids- Hydrostatic force on a submerged plane and curved surfaces- Buoyancy and equilibrium of floating bodies-Absolute and gauge pressure-Pressure measurement by manometers and pressure gauges.

UNIT II

Marks : 16

Fluid Kinematics and Fluid Dynamics-continuum Lagrange and an Euler an approaches- Classification of fluid motions- path line, stream line, streak line, stream tube, one, two and three dimensional flow, velocity field - acceleration of fluid particle in a velocity field-Continuity equation(one and three dimensional differential forms)- equation of stream line-stream function- velocity potential function-circulation- flow net- fluid dynamics- equations of motion- Euler's equation on gas stream line- Bernoulli's equation- applications- venturimeter, orifice meter, pitot tube. Dimensional analysis-Buckingham's Pi theorem-applications-similarity laws and models.

UNIT III

Marks : 16

Incompressible Fluid Flow-Viscous flow-Navier-Stokes equation (statement only)-Shear stress, pressure gradient relationship-laminar flow between parallel plates-Laminar flow through circular tubes (Hagen Poiseuille's) - Hydraulic and energy gradient-flow through pipes-Darcy Weisbach equation- pipe roughness-friction factor-Moody's diagram-minor losses-flow through pipes in series and in parallel- power transmission. Boundary layer flows, boundary layer thickness, boundary layer separation -drag and lift coefficients.

UNIT IV

Marks : 16

Fluid machines: definition and classification-exchange of energy- Euler's equation for turbo machines- head and specific work-components of energy transfer-degree of reaction. Hydro turbines: definition and classification-Francis turbine-Kaplan turbine- working principle-work done-specific speed-efficiency-performance curve for turbines.

UNIT V

Marks : 16

Pumps: definition and classification- Centrifugal pump : working principle, velocity triangles, specific speed, efficiency and performance curves-Reciprocating pumps: working principle, Indicator diagram and performance curves-cavitations in pumps-Rotary pumps: working principle of gear and vane pumps.



Text Books :

1. Kumar K.L.Engineering Fluid Mechanics, Eurasia Publishing House(P)Ltd,New Delhi (7 edition)1995.
2. Vasandani V.P.Hydraulic Machines-Theorand Design, Khanna Publishers 1992

References:

1. Streeter V.L. and Wylie E.B. Fluid Mechanics McGraw Hill1983.
2. EdwardJ.ShaughnessyJr.IraM.KatzandJamesP.Schaffer.IntroductiontoFluid MechanicsOxfordUniversityPress2005.
3. Jagdish Lal Hydraulic Machines Metro politan Book Co Delhi
4. Some and Biswas Introduction to Fluid Mechanics and Machinery Tata McGraw Hill

List of experiments (Pl. expand it):

- 1.Study of pipe fittings and study of devices used form measurement of pressure, velocity, rate of flow, Metacentric height and radius of gyration of floating bodies.
2. Experiment verification of Bernouli's theorem
3. Steady flow through pipes -determination of friction factor and Reynolds's number.
4. Determination of the loss coefficients for pipe fittings.
5. Hydraulic coefficients of mouth pieces, nozzles and orifices.
6. Calibration of Ventura meters, orifice meters, nozzle and bend meters. Force duet impact of jet son vanes.
7. Performance characteristics of centrifugal pumps at constant speed.
8. Constant head characteristics of Francis turbine.
9. Performance of hydraulic ram.



FS-0304 MANUFACTURING PROCESSES

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0304	MANUFAC TURING PROCESSE S	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

Unit I

Marks : 16

Engineering Materials:-Classification Properties-mechanical thermal chemical and technological. Iron and Steel-Processes and Classifications. Non-ferrous metals, processes, properties and use. Heat treatment of steels- purpose and methods. Processes-annealing, normalizing, hardening, tempering.

Unit II

Marks : 16

Welding: -Introduction, weld ability Types of welding, Gas welding, Arc welding-Sub merged arc, TIG, MIG. Resistance welding, Solid state welding, Electron beam welding, Laser beam welding. Oxygen cutting. Heat affected zones, Weld defects, Inspection of welded joints.

Unit III

Marks : 16

Metal Casting: - Pattern- pattern materials, types of patterns, pattern allowance, Molding sands-Properties and classification. Core and cores and Moulding process. Special casting methods-die casting, centrifugal casting, investment casting, slush casting .Casing defects and inspection.

Unit IV

Marks : 16

Metal Forming:-Mechanical working of metals. Hot working, cold working. Methods and process of rolling, forging and extrusion.

Unit V

Marks : 16

Machining:- Metal cutting, Orthogonal and Oblique cutting, Cutting tool materials. Classification of machine tools- lathe, shaper, milling machine, drilling machine and Grinding machine. Advanced machining methods-ECM,EDM,USM,AJM.



Text Book & References:-

- 1) S. Kalpakjian and S.R. Schmid Manufacturing Engineering and Technology, Pearson Education Asia
- 2) P.C.Sharma, A Text Book of Production Technology, S.Chand & Co, New Delhi.
- 1) Welding Handbook-Vol. I to V: American Welding Society.
- 2) Hein Lopper and Rosenthal, Principles of Metal Casting
- 3) Chapman, Workshop Technology Vol .I,II,III

List of Experiments (Pl. expand it):

1. To study Heat treatment of steels- purpose and methods
2. To study Arc welding-Sub merged arc, TIG, MIG.
3. To study Metal Casting: - Pattern- pattern materials
4. To Metal Forming:-Mechanical working of metals.
5. To Advanced machining methods-ECM,EDM,USM,AJM.



FS-0305 PRINCIPLES OF SAFETY MANAGEMENT

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MS T (c)	Total (d = e+f)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0305	PRINCIPLES OF SAFETY MANAGEMENT	3	1	-	6	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT:I

Marks : 16

Introduction-Safety-Goals of safety engineering. Need for safety. Safety and productivity Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. History of safety movement. Theories of accident causation Safety organization-objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer- responsibilities, authority, Safety committee-need, types, advantages.

UNIT:II

Marks : 16

Accident prevention Methods-Engineering, Education and Enforcement. Safety Education & Training-Importance, Various training methods, Effectiveness of training, Behavior oriented training. Communication-purpose, barrier to communication.

UNIT:III

Marks : 16

Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. House keeping. Work permits system-objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

UNIT:IV

Marks : 16

Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Cost of accidents-Computation of Costs-Utility of Cost data. Plant safety inspection types, inspection procedure. Safety sampling techniques. Job safety analysis(JSA), Safety surveys, Safety and its. Safety Inventory Technique

UNIT:V

Marks : 16

Accident investigation-Why? When? Where? Who? & How? Basics-Man- Environment & Systems. Process of Investigation-Tools-Data Collection-Handling witnesses-Case study. Accident analysis-Analytical Techniques-System Safety-Change Analysis-MORT-Multi Events Sequencing-TOR.

Text Books:

- 1) N.V. Krishnan, Safety Management in Industry, Jaico Publishing House, 1997
- 2) Ronald P. Blake, Industrial Safety, Prentice Hall, New Delhi, 1973
- 3) David L. Goetsch Occupational Safety and health Prentice Hall
- 4) Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Son

Reference:

- 1) Willie Hammer, Occupational Safety Management and Engineering, Prentice Hall
- 2) Alan Waring, Safety Management System, Chapman & Hall
- 3) John V. Grimaldi and Rollin H. Simonds Safety Management, All India Traveler Book Seller, Delhi.
- 4) Accident Prevention Manual for Industrial Operations: National Safety Council, Chicago



FS-0306 ELEMENTS OF MACHINE DRAWING

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total 1 (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0306	ELEMENTS OF MACHINE DRAWING	-	-	2	2	0	0	0	0	0	0	-	50	50	3 Hrs

UNIT-I

Marks : 16

Limits, fits & tolerances: IS919 code, cylindrical fits, tolerances holes, standard preferred sizes and fits hole based dimensioning, zymology for form, location and run out, tolerance ranking for position, concentricity, location, roundness, perpendicularity and runout.

UNIT-II

Marks : 16

Drawings of joints: Welded joints, types, welding symbols, drawing of welded machine parts with details of welding.

UNIT-III

Marks : 16

Brackets, blocks, base plate and crank shaft. Pipe joints: Coupler joints, nipple joints, union, socket and spigot, integral flanged joints and Hydraulic joints.

UNIT-IV

Marks : 16

Screwed fastenings: Screw thread forms, vee and square threads, conventional representation of threads, hexagonal headed bolt and nut, square headed bolt, nut locking arrangements, various types of machine screws and setscrews, foundation bolts, lock bolt with square plate, ray bolt and Lewis foundation bolt.

UNIT-V

Marks : 16

Cotter and Pin joints: socket and spigot joints, gib and cotter joint for angular rods, sleeve and cotter joints, knuckle joint.

Text books: References

- | | |
|-----------------------------|--|
| 1) N.D.Bhatt | : Machine Drawing, Charter Publishing House, Anand |
| 2) P.I.Varghese & K.C. John | : Machine Drawing: |
| 3) P.S. Gill | : Geometric Drawing, Kataria & Sons, Ludhiana |
| 4) Parkinson | : First year engineering Drawing, Pitman, London |
| 5) K.R. Hert | : Engineering Drawing with problems and solutions, ELB |



FS-0307 Seminar

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0307	SEMINAR	-	-	2	4	0	0	0	0	0	0	-	50	50	3 Hrs

UNIT – I

Marks :16

Topics to be covered in the Language Lab Sessions:

Introduction session: Introduce oneself, Family background, Educational qualification, Hobbies and interest, Expertise, Experience (If any), Strength and weaknesses.

UNIT – II

Marks :16

Body language: Importance of body language, Dressing sense, Walking sense, Talking and communication, Dining and eating sense.

UNIT – III

Marks :16

Telephonic etiquettes: How to receive calls, How to respond, How to make a call, Common expressions for calling. PPTs presentations: Improving speaking skills: Speech practices, Role plays (on stage), GD and Debate, Extempore speech, Word games, JAM (Just a minute) session, Describing objects and situations.

UNIT – IV

Marks :16

Reading skills: Improving reading skills, Paragraph reading, Storytelling and reading, Audio and video sessions.

UNIT – V

Marks :16

Writing skills: Paragraph writing, Word power/ vocabulary building, Article writing, Translations from Hindi to English and vice-versa. Presentation skills: Oral presentations, on all the learning sessions. Seminar on given topics.



FS-0308 MACHINE SHOP

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0308	MACHINE SHOP	-	-	2	4	0	0	0	0	0	0	-	50	50	3 Hrs

Introduction to Lathe: Spindle drive -work holding devices -types of Lathe tools -tool holders- tool movement- selection of speeds. Feed and depth of cut-use of cutting coolants-Principle of thread cutting -V-thread and Square thread -thread standards-cutting tool Types -grinding of tools-selection of cutting speeds. Exercises: Exercises involving cylindrical turning, Taper, Turning, Facing, Shoulder turning and curve turning – thread cutting.

Introduction to machine tools like horizontal milling machines, vertical milling machines, slotting and shaping machines, work holding devices- spindle drives-milling cutters-gear milling-surface slot milling-indexing head-simple and differential in dexing-grinding wheel- specification and selection-drilling and reaming-capstan and turret lathes-ideas of tool layout. Exercise :Exercises on lathe-curve turning ,multi star thread, drilling and boring, internal thread. Exercises on milling machines - surface milling and slot and keyway milling, straddle milling, machining of spur and helical gears.

Exercise son-Shaperandslotting-machiningofplaneandbevelsurfaces-keywayandslot achining, exercises on drilling and reaming, surface grinding and tool grinding.

References:

- 1) Production technology :HMT
- 2) Tool Engineer's handbook : ASTME
- 3) Burghardt, Axllered and Anderson,Machinetooloperations1&2
- 4) B.L. Boguslavsky, Automatic and semiautomatic lathes, Pease publications.
- 5) Fundamental soft tool design : ASTME



FS-0401 ENVIRONMENTAL ENGINEERING & MANAGEMENT

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTME -0401	ENVIRONMENTAL ENGG. & MANAGEMENT	3	1	0	4	80	25	20	100	0	0	0	0	100	3 Hrs

UNIT-I

Marks : 16

Air pollution-Sources of air pollution, effects of air pollution, classification of pollutants, Atmospheric transport of pollutants-wind profiles, atmosphere stability, inversion, turbulence, dispersion and diffusion of air pollutants, Gaussian plume dispersion model. Principles and techniques of ambient air and stack emission monitoring; Particulate matter control equipment- working principles of gravity settlers, cyclones, wet scrubbers, fabric filters and electro static precipitators; Gaseous control methods-an over view of absorption, adsorption and combustion methods; Biological methods for VOC and their control.

UNIT-II

Marks : 16

Physical, chemical and biological characteristics of waste water; Effects of pollutants on water quality and aquatic life; Physical unit operations in waste water treatment- flow equalization, sedimentation, and flotation; Chemical unit processes in waste water treatment- coagulation and flocculation, chemical precipitation and adsorption;

UNIT-III

Marks : 16

Biological unit processes-kinetics of microbial growth, Aerobic treatment systems: working principle and design parameters of trickling filter, activated sludge process, and rotating biological contactor; Anaerobic treatment systems: mechanism of an aerobic process, low rate and high rate digesters, working principle and applications of anaerobic filters and UASB; Biological nitrification -denitrification; Characteristics and treatment methods for the waste water from fertilizer plants, petroleum refineries, pulp and paper mills and distilleries.

UNIT-IV

Marks : 16

Solid wastes-environmental, aesthetic and health risk; Sources, quantities and composition of solid wastes; Storage, collection and transportation of urban solid waste, disposal options-sanitary and fills, composting and its variations, anaerobic digestion, incineration and pyrolysis; Vermicomposting; Recovery and alternative uses of solid wastes. Hazardous wastes-definition and classification, health and environmental effects, treatment, disposal and management of hazardous wastes, legal framework for hazardous waste management in India

UNIT-V

Marks : 16

Environmental management in industries-Principles and requirements of ISO 14001 EMS; Environmental auditing and auditing for waste minimization; Environmental impact assessment- description of the environmental setting, prediction and assessment of impacts, methods of impact analysis, Indian scenario, public participation in environmental decision making. Strategies for Pollution prevention –recycle and reuse, cleaner technologies. Life cycle assessment –principle and methodology. The concept of industrial ecology. Clean development mechanism (CDM)- carbon trading.



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Text Books:

1. C.S.Rao: Environmental Pollution Control Engineering, New Age International(P)Ltd Publishers,1991.
2. M.N. Rao and A.K.Dutta: Waste water Treatment, Oxford & IBH Publishing Co.Pvt. Ltd, NewDelhi,1987.:

References

- 1)Pavani, J.L: Hand book of solid waste Disposal and Management
- 2)Metcalf and Eddy Inc.: Waste Water Engineering: Treatment, Disposal, Reuse
- 3) Canter. L.W: Environmental Impact Assessment
- 4)Liu, I(Ed):Environmental Engineers Handbook(2ndEdn)



FS-0402CHEMICALENGINEERINGII

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MS T (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0402	CHEMICAL ENGINEERING II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Heat transfer

Heat transfer by conduction, steady state conduction, Fourier's law, heat transfer coefficient, heat exchangers- shell and tube heat exchanger and double pipe heat exchanger, LMTD, individual heat transfer coefficient, overall heat transfer coefficient, heat transfer by convection-natural convection, forced convection in laminar and turbulent flow (elementary ideas).

UNIT-II

Marks : 16

Radiation heat transfer-laws of radiation. Evaporators –heat transfer in evaporators, single effect evaporator calculations, types of evaporators

UNIT-III

Marks : 16

Mass transfer

Principles of mass transfer, Fick's law of molecular diffusion, diffusion in solids and liquids. Distillation – relative volatility, simple distillation, steam distillation, distillation wither flux, principle of isotropic and extra active instillation McCabe Thiele met hod of calculation of number of theoretical stages, total, minimum and optimum flux. Absorption, equilibrium solubility of gases in liquids, plate and packed columns, packing materials.

UNIT-IV

Marks : 16

Mass transfer

Introduction to drying-equilibrium moisture and free moisture, critical moisture content, bound and unbound water, rate of drying curves, drying equipments-tray dryers, tower dryers, rotary dryers, fluid-bed dryers, spray dryers. Principle of liquid-liquid extraction, liquid-liquid equilibrium, equipment for liquid extraction - mixer Settlers, spray towers, Bellman extractor. Solid-liquid extraction-simple leaching, major Equipments for solid-liquid extraction

UNIT-V

Marks : 16

Chemical reaction engineering

Classification of reactions, variables affecting rate of reaction, definition of reaction rate. Kinetics of homogeneous reactions-concentration pendent term of a rate equation, temperature dependent term of a rate equation, theories of reaction-collision theory, transition theory, Arrhenius equation. Interpretation of rate datain constant volume batch reactors. Ideal reactors-the concept of ideality, design expressions for batch, tubular and stirred tank reactors. Elementary idea saffron-ideal reactor performance, residence time distribution.



Text books

- 1.W.L. McCabe, J.C. Smith & Peter Harriott, Unit Operations of Chemical Engineering, McGraw- Hill Book Co,
- 2.O. Levenspiel, Chemical Reaction Engineering, John Wiley & Sons,

Reference books

- 1.W.L.Badger & J.T.Banchero, Introduction to Chemical Engineering, Tata McGraw-Hill
- 2.Robert E. Treybal, Mass Transfer Operations, McGraw Hill
- 3.Christe J. Geankoplis, Transport Process and Unit Operations, Prentice Hall India Pvt Ltd.
4. Lanny D. Schmidt, The Engineering of Chemical Reactions, Oxford University Press, 2005

List of Experiments

1. To study of Heat transfer by conduction
2. To study of Radiation heat transfer-laws of radiation
3. To study of Principles of mass transfer.
4. Details of Classification of reactions.
5. To study of Kinetics of homogeneous reactions.



FS-0403 STRENGTH OF MATERIALS

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0403	STRENGTH OF MATERIAL	3	1	2	6	80	25	20	100	50		50	100	200	3 Hrs

UNIT-I

Marks : 16

Simple Stress and Strain and Principal Stresses Axial and shear stresses and strains-elasticity, Hook's law-factor of safety, Step ped bars, Bars of uniformly varying cross-sections- Lateral Strain- Poisson's ratio-Volumetric strain- elastic constants and the irrigation ships- stresses in composite bars due to axial loading and temperature.

UNIT-II

Marks : 16

Strain energy due to axial load-stresses due to impact and suddenly applied loads. State of stress at a point-Normal and tangential stresses on a given plane-Principal stresses and their planes, plane of maximum shear-Mohr's circle of stresses.

UNIT- III

Marks : 16

Shear Force and Bending Moment Relationship connecting intensity of loading, shearing force and bending moment; Shear force and bending moment diagrams for cantilever, simply supported and over hanging beams subjected to concentrated load and UDL-maximum bends moment and point to contra flexure. Theory of simple bending-assumptions and limitations- Derivation of bending formula and its applications to engineering problems

UNIT-IV

Marks : 16

Deflection of Beams and Thin and thick walled structures Differential equation of the elastic curve. Slope and deflection of beams by method of successive integration, Mc Causley's method. Hoop and longitudinal stresses in the walled cylindrical and spherical shells subjected to internal pressure-Changes in dimension and volume; Thick Cylinders-Lame equations, shrink fit, compound cylinders, wire wound cylinders

UNIT- V

Marks : 16

Torsion and Columns Theory of torsion and assumptions- Torsion of solid and hollow circular shafts- Power transmission, strength And stiffness of shafts. Close and open coil edhelical springs. Theory of columns-buck ling and stability, buckling of long columns, Euler's Formula, Long columns with different support conditions

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Text book:

1. Gere,M.J."MechanicsofMaterials",ThomsonLearning.
2. Subramanian,R."StrengthofMaterials",OxfordUniversityPress,2005.

References:

1. Popov,E.P., "AnalysisofStructures,"KhairnaPublishers,1985.
2. Vazirani,V.NandRatwani,MM," MechanicsofMaterials",PrenticeHall,1982.
3. Ramamurtham,S., "StrengthofMaterials",DhanpatRai&Sons,1974

List of experiments (expandable)

1. Standard tension test on M. Sousing U.T. M and a suitable extensometer Torsion test on M. Specimen Dou
2. Bleshear teston M.Srod
3. Impact Tests–Izod and Charpy
4. Hardness tests-Brinnel, Vickers and Rock well hardness Test on springs
5. Tests on wood
 1. Flexural test(b)Compression test
Compressive strength of masonry units
(a)Bricks (b)Stone(c) hollow block units
Fatigue test
- Strut test
- 6.Verification of Clerk Maxwell's law of reciprocal deflection and determination of Young's Modulus.



404 FIRE ENGINEERING-I

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0404	FIRE ENGINEERING-I	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Introduction- temperature, heat, specific heat, flash point, fire point, ignition, combustion; Ignition- pilot ignition, spontaneous ignition, ignition sources; Types of combustion-rapid, spontaneous, explosion; Product of combustion-flame, heat, smoke, fire gases Development to fire-incipient, smoldering, flame and heat stages; Diffusion flames-zones of combustion, shouldering combustion, characteristics of diffusion flame; Premixed flames-burning velocity, limits of flammability, explosion and expansion ratios, deflagration and detonation, characteristics of premixed flame; Explosion- physical explosion, chemical explosion; Special kinds of combustion-Flash fire, Pool fire, Deep seated fire, Spoillver, Boil over, Slop over, Dust explosion, BLEVE, UVCE; Classification of fire based on material.

UNIT-II

Marks : 16

Spread of flames in solids and liquids, linear and three dimensional fire propagation; Smoke - constituents of smoke, quantity and rate of production of smoke, quality of smoke, smoke density, visibility in smoke, principles of spreading quantity of smoke, smoke movement; Pressurization modeling of smoke movement; Toxicity of smoke-effect of harmful agents preventing escape and causing injury or death- CO,CO₂,Nitrogen oxide, Shulphar dioxide.

UNIT-III

Marks : 16

Use and maintenance of fire Service Equipments- Hydrants and stand pipes, Hose reels-hose fittings- coupling, Branches, Branch holders, Radial branches, Monitors, Nozzles, Collecting heads, suction, hose fittings, adopters and ramps. Introduction to fire fighting vehicles and appliances:- Pumps, primers. Crash tenders, rescue tenders,

UNIT-IV

Marks : 16

hydraulic platforms, turntable ladders, hose laying tenders, control vans, fire boats. Ladders- features o extension ladders, wheels escape, hook ladder, turn-table, Snorkel, safety devices, uses and maintenance. Small gear and miscellanea use equipments'-General purpose tools and equipment, Lamps and lighting sets. Ropes and Lines-Types-wire and rope lines use din fire service. Use and testing of lines, knots, Bends and hitches, General rope work

UNIT-V

Marks : 16

Fire hydraulics: Briefed planet stream, pressure looser gain because of elevation, static flow and hydraulic pressures, suction, drafting, friction loss. Advantages of multiple lines. Discharge capacities of nozzles on hose lines. Nozzle reaction. Pressure differential fire ground hydraulics:- method of determining flow and direction loss; standard nozzle pressures; GPM method Application of GPM method for hand lines, multiple hose lines, master stream appliances, stand pipes and appliances, conversion of various hose sizes, small lines, unequal discharge pressure, back pressure, unequal hose diameters.



Text Books

1. Ron Hirst, "Under downs Practical Fire Precautions", Gower Publishing Company Ltd., England, 1989.
2. HMSO, "Manual of Firemanship 1 to 13",
3. Jain V.K., "Fire Safety in Buildings", New Age International (P) Ltd., New Delhi, 1996
4. James F. Cassey, "Fire service hydraulics",

Reference Books

1. Gupta R.S. "A Handbook of Fire Technology".
2. Kevin Cassidy, "Fire Safety and loss Prevention".
3. NFPA, "Fire Protection Handbook".
4. NSC, "Accident Prevention Manual for Industrial Operation"
5. Panchdhari A.C., "Management of Fire".

List of Experiments (Please Expand it)

1. Introduction of Fire and its types.
2. Classification of Extinguisher.
3. Uses and maintenance of Fire service equipments.
4. To study of Hydrant system.
5. To study of all types of Risers.



FS-0405 ELECTRICAL TECHNOLOGY & SAFETY IN ELECTRICAL SYSTEMS

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0405	ELECTRICAL TECH. & SAFETY IN ELECTRICAL SYSTEM	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Construction and Principle of operation of the machines- e.m.f equation of generator-use of interpoles-characteristics of shunt, series and compound generators- starting and speed control –losses and efficiency. Construction and Principle of operation of single phase transformers-e.m.f equation-phase diagrams-equivalent circuit-regulation-losses and efficiency.

UNIT-II

Marks : 16

Protective relays - Requirement of relay - types of protection - classification - distance relay, differential relay, static relays.

UNIT-III

Marks : 16

Synchronous machines-types-e. m. equation- winding factors-armature reaction and leakage resistance. Synchronous motor-methods of starting-applications. Induction Motors – Construction and principle of operation - equivalent circuit - Torque - slip characteristics-method of starting-applications. Circuit breakers-function of switch gear-arc phenomenon-initialization of an arc-arc interruption - recovery voltage and restriking voltage-MCB and ELCB. Faults in power systems- causes-types.

UNIT-IV

Marks : 16

Fuses-types-selection- advantages and disadvantages. Grounding - neutral grounding- solid grounding - resistance grounding - arc suppression coil grounding. Equipment grounding for safety - grounding substation - grounding of line structure. Earthing Effect of electric and magnetic fields-Human safety aspects- effect of current and voltage on human beings- Typical V-I characteristics of skin-Electrical shocks and their prevention. Insulation-classes of insulation-FRL Simulation –continuity test.

UNIT-V

Marks : 16

Safety during installation of plant and equipment. Safe sequences in installation –risk during installation. Safety during testing and commissioning. Test on relays – protection and inter lock systems for safety. Hazardous zones –classification of hazardous zones. Intrinsically safe and explosion proof electrical apparatus. Selection of equipments in hazardous area. Electrical fires- hazards of static electricity. Safe procedures for electrical maintenance-Statutory requirements. Safety provisions in Indian Electricity Act & Rules.



Text Books:

1. H.Cotton:ElectricalTechnology,WheelerPublishingCompany,1983.
2. Swan.H.W:ElectricalSafety

Reference Books

1. S.L. Uppal: A TextbookofElectricalEngineering,KhannaPublishers,Delhi..
2. NSC, Chicago:AccidentPreventionManualfor IndustrialOperations
3. M.G.Say:ElectricalEarthingandAccidentprevention
4. S.Rao,and H.L.Saluja: ElectricalSafety,Fire EngineeringandSafetyManagement, KhannaPublishers,Delhi.
5. Indian ElectricityAct&Rules.

List of Experiments (Pl. expand it):-

1. Verification of Kirschoff's Laws
2. Verification of Super position Theorem
- 3.Study of B.H.CurveonC.R.O
4. Measurement of power nap A.C. circuit by3 ammeter and 3 voltmeter method
- 5.Load test on a d.c. series motor
- 6.Speed characteristics of the c. shunt motor
- 7.Regulation of a Transformer
- 8.Load characteristics of a 3 phase induction motor
- 9.Study of protective relays and circuit breakers.
- 10.Study of insulation testing and ground testing.



FS-0406 FIRSTAID AND EMERGENCY PROCEDURES

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0406	FIRST AID & EMERGENCY	-	-	2	2	0	0	0	0	0	0	-	50	50	3 Hrs

UNIT-I

Marks : 16

Aims and Objectives. First Aid principles–Role of the first aider–sequence of action on arrival at scene. Vital signs–breathing –pulse. Introduction to the body–basic anatomical terms–body cavities–head– cranium–thorax–abdomen and pelvis.

UNIT-II

Marks : 16

Bio mechanics –Structure and functions of musculoskeletal systems, tendons, ligaments, fascia, bone, muscles, joints and basic mechanisms. The respiratory system–respiratory failure–asphyxia–abdominal thrust in Heimlich man oeuvre. Chest injuries–types–fracture ribs –pneumothorax– haemothorax.

UNIT-III

Marks : 16

The nervous system–functions–components–brain–cerebrum–cerebellum–medulla oblongata–cerebra–spinal fluid–spinal cord–autonomic nervous system. Un consciousness–causes–level of consciousness–management of unconscious casualty– problems of un consciousness. Fainting– recognition–management–aftercare. Diabetes–hypoglycemia–hyperglycemias–management. Seizures (epileptic fits, convulsions) features–management, stroke. Head injuries –fractures of the base– vault and sides of skull.

UNIT-IV

Marks : 16

The circulatory system–heart attack–chest compression– CPR Shock–causes– signs and symptoms– management of shock. Eye–eye injuries–foreign body in eye–eye trauma–corrosive chemical in eye–arc eye. Wounds bleeding–classification–types of wounds–case of wounds–bleeding from special sites.

UNIT-V

Marks : 16

Fractures–classification of fractures–principles of immobilization– sprains and dislocation. Broad and narrow fold bandages–hand bandages–slings. The skin. Burns–rule of nines–pure thermal burns. Electric burns. Chemical burns. Radiation burns. Cold burns. Poisoning. Physical fitness. Lifting–casualty handling. Use of stretchers.

References:

- 1) Manual of first aid to the injured
- 2) First aid textbook
- 3) Manual of First aid instruction
- 4) V.V. Yudenich,

: St. John Ambulance Association.
: American National Red Cross
: USB Bureau of Mines
Accident First Aid, Mir Publishers, Moscow



FS-0407 Project Work

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0407	Project Work	-	-	4	4	0	0	0	0	0	0	-	50	50	3 Hrs



FS-0501 SAFETY IN CONSTRUCTION

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0501	SAFETY IN CONSTRUCTION	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Introduction to Construction Industry- Safety issues in construction- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry. Framing Contract conditions on safety, and related matters. Relevance of ergonomics in construction safety.

UNIT-II

Marks : 16

Safety in various construction operations- Excavation- under- water works- under- pinning & shoring Ladders & Scaffolds- Tunneling- Blasting- Demolition- Pneumatic caissons- confined Space Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety.

UNIT-III

Marks : 16

Safety in material handling and equipments-Safety in storage & stacking of construction materials.

UNIT-IV

Marks : 16

Safety in these of construction equipments- Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction. Temporary power supply.

UNIT-V

Marks : 16

Contract Labor (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Workers (RE&CS) Act,1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Well fare provisions, Penalties.



References:

- 1.K.N.Vaid,ConstructionSafetyManagement.
2. V.J.DaviesandK.Tomasin,ConstructionSafety Handbook.
3. JamesB.Fullman,ConstructionSafety,Security&LossPrevention
- 4.LingerL,ModernMethodsofMaterialHandling
5. R.T.Ratay,HandbookofTemporaryStructuresinConstruction.
6. NationalBuildingCodeofIndia
- 7.RelevantIndianStandardspublishedbyBIS
8. ContractLabourActandCentralRules
- 9.Building&OtherConstructionWorkers(RE&CS)Act,1996andCentralRules.

List of Experiments:

1. Study of PPE's.
2. Assessment of the safety performance in an industry and preparation of report..
3. Accident investigation and Analysis-Exercises
4. Job safety analysis- Exercises
5. Safety survey of a laboratory.
6. Safety audit of a laboratory.
7. Calculation of cost of accidents.
8. Preparation of work permits.
9. Safety assessment in a construction site.
- 10.Design and development of a training module on any topic of safety.
- 11.Preparation of a P & I digram using Auto Cad.



FS-0502 CHEMICAL ENGINEERING-III

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0502	CHEMICAL ENGG. III	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

In organic chemical technology

Chloe - alkali industries-soda ash-caustic soda-chlorine-hydrochloric acid. Manufacture of sulphuric acid. Phosphorous in dustries-phosphoric acid-wet process phosphoric acid, electric furnace Phosphoric acid, single super phosphate and triple super phosphate. Nitrogenous industries-ammonia, nitric acid, urea, ammonium sulphate, ammonium phosphate. (Only the processes currently in use in industries need be covered)

UNIT-II

Marks : 16

Organic chemical technology

Manufacturing processes for pulp and paper, sugar, industrial alcohol by fermentation-Absolute alcohol, beers, wines, oils and fats, soaps and detergents, agro chemicals, introduction to polymers, synthetic rubbers-SBR neoprene, urethane rubbers. (Only the processes currently in use in industries need be covered)

UNIT-III

Marks : 16

Bioprocess engineering

An overview of traditional and modern applications of biotechnological processes, outline of an integrated bioprocess and the various (up stream and downstream) unit operations involved in bioprocesses, general requirements of fermentation processes, types of fermenters and bioreactors, auxiliary instrumentation of bioreactors, main parameters to be monitored and controlled in fermentation processes, Enzymes-mechanism of enzyme action, introduction to enzyme kinetics, Michaels- Menten kinetics, methods of enzyme mobilization.

UNIT-IV

Marks : 16

Chemical plant design and economics Processed sign development- types of designs, feasibility survey, preliminary design, flow diagrams, piping and instrumentation diagram, batch versus continuous operation, factors in equipment scale up and design, equipment specifications.

UNIT-V

Marks : 16

General design considerations- plant location, selection of plant site, plant layout. Detailed engineering-mechanical, structural, electrical and instrument designs. Capital cost estimates - fixed and working capital, cost escalation, cost indexes estimating equipment costs by scaling. Selection of materials for chemical plant construction under ordinary temperature and pressure and high temperature and pressure conditions.



Text Books

1. M. Gopal Rao & M. Sittig (Eds), Dryden's Outlines of Chemical Technology, Affiliated East West Press
2. Michael L. Shuler and Fikret Kargi, Bioprocess Engineering: Basic Concepts, Prentice-Hall of India, 2002.

Reference Books

1. Max S. Peters and Klaus D. Timmerhaus, Plant Design and Economics for Chemical Engineers, Mc Graw-Hill Book Company, 2004.
2. G. T. Austin (Ed), Shreve's Chemical Process Industries, Mc Graw Hill Book Company

List of Experiments:

1. Sieve Analysis- To analyse given sample using a set of standard sieves and thus to determine the specific surface area, the volume surface mean diameter and the mass mean diameter by differential analysis and cumulative analysis.
2. Study of the working of Plate and frame filter press.
3. Free settling- To find out the drag coefficient of a falling sphere in a fluid and verification of Stoke's law.
4. Sedimentation- To study batch sedimentation of a slurry and to determine there a of the continuous thickener.
5. Heat transfer from steam to air- Determination of overall heat transfer coefficient.
6. Verification of material balance equation and Rayleigh's equation for simple distillation.
7. Steam distillation.
8. Leaching- leaching mixture of salt and sand.
9. Study of the kinetics of chemical reaction in a batch reactor.
10. Adsorption isotherms.
11. Frequency response of first and second order systems



FS-0503 PRINCIPLES OF ENGINEERING DESIGN

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0503	PRINCIPLES OF ENGG. DESIGN	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Introduction to design- steps in design-design factors-practical considerations in design- the orison failure- Stress concentration-consideration of creep and thermal stress in design.

UNIT-II

Marks : 16

Detachable joints- design of screws- thread standards- thread stress- pre-loading of bolts- external load with pre-load-fatigue and shock loading-Types of keys-types of pins-design of cotter and pin joint.

UNIT-III

Marks : 16

Riveted Joints-stresses in riveted joints- design of riveted joints subjected to central & eccentric load spoiler and tank joints-structural joints. Welded joints-types of welded joints-design of welded joints subjected to axial, torsion and bending loads.

UNIT-IV

Marks : 16

Springs-stresses in helical spring-deflection of helical compression and extension Spring-springs subjected To fatigue loading-concentric and helical torsion spring –critical frequency of springs-leaf springs-design of automotive leaf springs Power Shafting- Design for static loads- combined stresses- design of shaft for strength and deflection- axial load on shaft

UNIT-V

Marks : 16

Design of cylindrical and spherical vessels for internal and external pressures-design of heads and enclosures- Tall vessels- supports for vessels-non standard flanges-pipe line design. Design of storage tanks.



REFERENCE

1. Joseph Edward Shingley, Mechanical Engineering Design
2. V.I. Doughite, Design of Machine Elements
3. J. Myatt, Machine Design
4. L.E. Brownell and B.H. Young, Process Equipment Design
5. M.V. Joshi, Process Equipment Design,
6. IS 2825:1969-Code for unfired pressure vessels (to be permitted for examination)
7. Design Data Books (to be permitted for examination)
- 1 Prof. B.R. Narayanalingar & Dr. K. Lingaiah
- 2 PSG Tech.
3. Prof. Mahadevan

List of Experiment (Expandable):

- 1- Study of thermal stress in design
- 2- Detachable joints- design of screws- thread standards.
- 3- Riveted Joints- stresses in riveted joints
- 4- Design for static loads- combined stresses
- 5- Design of cylindrical and spherical vessels.



FS-0504 FIRE ENGINEERING-II

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS-0504	FIRE ENGINEERING-II	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Effect of temperature on the properties of structural materials-concrete, steel, masonry and wood; Behavior of non-structural materials on fire- plastics, glass, textile fibers and other house hold materials; Determination of combustibility by fire tube method;

UNIT-II

Marks : 16

Brief description on non combustibility test and classification of flames predate of materials as per relevant standards(BIS). Compartment fire-factors controlling fire severity, ventilation controlled and fuel controlled fires; Spread of fire in rooms, with in building and between buildings.

UNIT-III

Marks : 16

Experimental determination of fire resistance-types of furnaces; Approximate methods for calculating the fire resistance of structural elements- Schematic diagrams, influencing factors; Concept of static, thermal engineering and experimental methods for the calculation of fire resistance; Principle of the calculation of the fire resistance limits of structures- coefficient of fire resistance, fire duration; Approximate calculation of the required fire resistance for a building.

UNIT-IV

Marks : 16

Fire area-calculation of building fire area, sub division of fire areas in Industrial, Residential and Public buildings; Fire separation between building- principles of calculation of safe distance. Design principles of fire-resistant walls and ceilings; Fire resistant screens-solid screens and water curtains; Local barriers; First opted areas-in proof, in fire areas and in connecting structures; Fire doors-Low combustible, Non combustible and Spark-proof doors; suspension of doors; Air-tight sealing of doors; Specification, test and performance criteria of Plate, Metal covered and Rolling type fire drapers relevant standards(ISI).

UNIT-V

Marks : 16

Fabricated fire proof boards- calcium silicate, Gypsum, Vermiculite, and Partite boards; Fire protection of structural elements-Wooden, Steel, RCC, and Plastic structures; Reparability of fire damaged structures- Assessment of fire severity, Assessment of damage to concrete, steel, masonry and timber structures, Assessment of feasibility of repair; Repair techniques repair methods to Reinforced concrete Columns, beams and slabs, Repair to steel structural members, Repair to masonry structures.

Swami Vivekanand University, Sagar(M.P.)

Text Books

1. Roytman M. Ya., "Principles of Fire Safety Standards for Building Construction", Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975
2. Smith E.E. and Harmathy T.Z. (Editors), "Design of Buildings for fire safety", ASTM Special Publication 685, American Society for Testing and Materials, Boston, U.S.A., 1979.
3. E. Gordon Butcher E.G. and Parnell A.C., "Designing of fire safety", John Wiley and sons Ltd, New York, U.S.A., 1983

Reference Books

1. Marchant E.W., "A Complete Guide to Fire and Building",
2. Adam and Charles Black, "Fire safety in Buildings",
3. HMSO, "Fire protection in factory building",
4. BIS, "IS-12777-Fire safety-flame-spread of products- Method for classification, Bureau of Indian Standards, New Delhi, 1989.
5. BIS, "IS-3614 (Part-1)-Specification of fire check doors-part 1: Plate, metal covered and rolling type" Bureau of Indian Standards, New Delhi, 1966.
6. BIS, "IS-3614 (Part-2)-Specification of metallic and non-metallic fire check doors-part 2: Resistance test and performance criteria, Bureau of Indian Standards, New Delhi, 1992

List of Experiment (Pl. expand it):

1. Effect of temperature on the properties of structural materials
2. Brief description on non combustibility test
3. Experimental determination of fire resistance
4. Fire area-calculation of building fire area
5. Reparability of fire damaged structures-Assessment of fire severity

Swami Vivekanand University, Sagar(M.P.)

FS-0505 PRINCIPLES OF INDUSTRIAL MANAGEMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0505	PRINCIPLE OF INDUSTRIAL MANAGEMEN T	3	1	-	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT- I

Marks : 16

Organization: Concept of organization, characteristics of organization, elements of organization, organizational structure, organization charts, Types of organization-line & staff organization, functional organization, project organization, matrix organization, Management: Functions, Evolution of management theory, Principles of scientific management.

UNIT-II

Marks : 16

Personnel Management: Motivation theories, Leadership theories and models, Recruitment and training, labor turnover, operator training, Wages and Incentives: feature of wages, time and piece rate, incentive plans, profit sharing.

UNIT-III

Marks : 16

Job evaluation, Merit rating methods-factors of comparison and point rating-defects. Industrial Relations: industrial disputes, collective bargaining, trade unions, workers' participation in management, labor welfare.

UNIT-IV

Marks : 16

Production Management: Production System-Functions-Product Design-Product Life Cycle. Demand forecasting for operations- components of demand-methods of prediction and forecasting- Forecasting models- casual & time series PPC-Functions-Models Capacity Planning – Evaluating future capacity - capacity requirement -Aggregate Planning Inventory Control-Objectives- Costs-Models: Basic, Production, Shortage- ABC Analysis.

UNIT-V

Marks : 16

Project Management: Project Appraisal –Feasibility Analysis, Market feasibility, Technical feasibility, Financial feasibility, Economic feasibility, Financial and Economic appraisal of a project, Social Cost- Benefit Analysis in India, Project Report. Project Scheduling: Network Techniques, PERT, CPM, GANTT charts, GERT, Time cost trade off and crashing procedure

References:

1. Buffa, E.S., Modern Production and Operations Management, 7th edn., John Wiley and Sons, 1983.
2. Prasanna Chandra., Projects Planning, Analysis, Selection, Implementation & Review, 4th edn., Tata McGraw Hill, New Delhi, 1995.
3. Kootnz and Donnel., Principles of Industrial Management
4. Martand Telsang, Industrial Engineering and Production management, 2nd edn., S. Chand & Co., New Delhi



Swami Vivekanand University, Sagar(M.P.)



FS-0506 Seminar

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0506	Seminar	-	-	2	2	0	0	0	0	0	0	-	50	50	3 Hrs



Swami Vivekanand University, Sagar(M.P.)



FS-0507 Project Work

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0507	Project Work	-	-	4	4	0	0	0	0	0	0	-	50	50	3 Hrs



FS-0601 LEGAL ASPECTS OF SAFETY, HEALTH AND ENVIRONMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0601	LEGAL ASPECTS OF SAFETY, HEALTH & ENVIRONMENT	3	1	0	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT-I

Marks : 16

Factories Act- Definitions, Preliminary, Inspecting staff, Health, Safety, Provisions relating to hazardous processes, Welfare, Working hours of adults, Employment of young persons, Special provisions. Dock workers (Safety, Health and Welfare) Act and Regulations - Definitions, Powers of Inspectors, Power of Govt. to direct Inquiry, Obligation of dock workers. Duties of Safety Officers, Reporting of accidents, Emergency Action Plan, Safety Committee.

UNIT-II

Marks : 16

Work men's Compensation Act: Definitions, Employer's liability for compensation, Calculation of amount of compensation. ESI Act and Rules: Applicability to Construction, Definitions and Benefits as per the Act & the Rules. Public Liability Insurance Act and Rules- Definitions, Calculation of amount of relief, Environmental Relief Fund, Advisory Committee, Powers of District Collector, Extent of Liability, Contribution to Relief Fund

UNIT-III

Marks : 16

Explosives Act and Rules-Definitions, Categories of Explosives, General Safety Provisions, Use of Explosives Grant of license, Notice of Accidents, Inquiry in to ordinary and more serious accidents, Extension of definition to other explosive substances. Petroleum Act & Rules-Definitions, Control over Petroleum import, transport, storage, production, refining and blending, Need for license, exemption, Notice of Accidents and Inquiries.

UNIT-IV

Marks : 16

Water Act- Definitions, Powers and Functions of Boards, Provisions regarding prevention and control of water pollution, Power to make rules, Rules on Consent for Establishment and Operation. Air Act- Definitions, Power & Functions of Boards, Prevention & Control of Air Pollution, Consent as per Air Pollution Rules.

UNIT-V

Marks : 16

Environment

(Protection) Act and Rules- Definitions, general powers of central government, prevention, control and abatement of environmental pollution, standards for emission, prohibition and restrictions on sitting and operation of industries. MSIHC Rules- Definitions, Duties of Authorities, Notification of Major Accidents Safety Reports, Safety audit, MSDS, On-site & Off- site Emergency Plan, Giving safety information to public.



References

1. Factories Act, 1948 with amendments of 1976 & 1987.
2. Dock Workers (SHW) Act, 1986; Rules, 1990 & Regulations, 1990.
3. Explosives Act and Rules.
4. Petroleum Act and Rules.
5. Environmental Acts & Rules as above.



FS-0602 CHEMICAL PROCESS SAFETY

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0602	CHEMICAL PROCESS SAFETY	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

SAFETY IN THE DESIGN OF CHEMICAL PROCESS PLANTS :-Design principles-reliability and safety in designing- inherent safety-engineered safety- piping and instrumentation-safety during start up and shut down-safety checks in the design of the equipments- reactor safety-safety in erection and commissioning of chemical plants-non destructive testing methods –pressure and Leak testing-emergency safety devices-scrubbers and flares-new concepts in safety design and operation- Pressure vessel testing's standards- Gassy lender rules, SMP Rules-In section techniques for boilers and reaction vessels.

UNIT-II

Marks : 16

SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS:- Properties of chemicals - Material Safety Data Sheets- the various properties and formats used- methods available for property determination. Operational activities and hazards- standards operating procedures- safe operation of pumps, compressors, heaters, column, reactors, pressure vessels, storage vessels, piping systems- effects of pressure, temperature, flow rate and humidity on operations- corrosion and control measures- condition monitoring-control valve-safety valves-pressure reducing valves, drains, by pass valves, inert gases. Chemical splashes, eye irrigation and automatic showers.

UNIT-III

Marks : 16

SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES:- Types of storage- general considerations for storage layouts- atmospheric venting, pressure and temperature relief - relief valve sizing calculations- storage and handling of hazardous chemicals and industrial gases, safe disposal methods, reaction with other chemicals, hazards during transportation-pipeline transport-safety in chemical laboratories. Safety provisions like level and flow in dictators- alarms, trips- protection of stills, columns and to wars from lightening- color coding for pipe lines and cylinders

UNIT-IV

Marks : 16

CHEMICAL REACTION HAZARDS: Hazardous in organic and organic reactions and processes, Reactivity as a process hazard, Detonations, Deflagrations, and Run aways, Assessment and Testing strategies, Self-heating hazards of solids, Explosive potential of chemicals, Structural groups and instability of chemicals,



UNIT-V

Marks : 16

Thermo chemical screening, Case studies. Stability and sensitivity tests, Classification of materials with explosive potential, Hazard prediction by thermo dynamic Calculations, Prevention and control of explosions and detonations- diluting are lease, purging and inserting, venting, explosion relief, flame arrestors, explosion suppression, Classification of hazardous areas.

References:

Ralph King and Ron Hirst, King's Safety in the Process Industries,
Arnold,London,1998
Industrial Environment and its Evolution and
Control :NIOSH
Accident Prevention Manual for Industrial Operations :Vol.I &
II NSCChicago
Sax NIrvin, Dangerouspropertiesof
industrialmaterials

List of Experiments:

1. SAFETY IN THE CHEMICAL PROCESS PLANTS
2. SAFETY IN THE OPERATION OF CHEMICAL PROCESS PLANTS
3. SAFETY IN THE STORAGE AND HANDLING OF CHEMICALS AND GASES
4. SAFETY IN CHEMICAL REACTION HAZARDS
5. CASE STUDIES OF THERMO CHEMICAL SCREENING



FS-0603 PROCESS INSTRUMENTATION AND CONTROL ENGINEERING

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS-0603	PROCESSINSTRUMENTATION & CONTROL ENGG.	3	1	-	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT-I

Marks : 16

Elements of measurement- Fundamental standards, Quality of measurement, Meaning of measurement, Errors in measuring instruments, Precision and accuracy, Calibration principle, Static and dynamic characteristics of Assuring instruments.

UNIT-II

Marks : 16

Measurement of temperature – Bimetallic and pressure thermometers, Thermocouples, Resistance thermometers, Pyrometer, Calibration. Pressure and vacuum measurement- Manometers, Measuring element, Absolute pressure measurement, Static accuracy of pressure gauges.

UNIT-III

Marks : 16

Flow measurement- Orifice installation, Pitot tube, Area flow meters, Open channel meters. Level measurement- Direct method, Measurement of level in open and pressure vessels. Measurement of PH and humidity. Recording Instruments, Indicating and signaling instruments, Signal transmission, and codes

UNIT-IV

Marks : 16

Open loop and close loop systems – Transfer function modeling- block diagram representation of mechanical, thermal and liquid level systems. Transient response analysis-Time response of first and second order system for impulse and step inputs- Effect of damping factors on transient response-Characteristics of proportional, integral, derivative, PI,PD And PID controllers. Frequency response method of analysis-polar plot-Bode Plot

UNIT-V

Marks : 16

Introduction to stability-Definition via impulse response function- Routh- Hurwitz stability Criterion -Nyquist stability criterion. Control system components-error detectors-modulators and demodulators-Hydraulic controllers -Pneumatic controllers-PLC. Introduction to computer control in chemical process industry. Comparison between discrete data, digital and analogue control systems. Introduction to digital signal processing.

Swami Vivekanand University, Sagar(M.P.)

Text Books

1. D Patranabis, Principles of Industrial Instrumentation, Second Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1996.
2. George Stephanopoulos, Chemical Process Control : An Introduction to Theory and Practice, Prentice Hall of India Pvt. Ltd, 1990.

References

1. Eckman DP, Industrial Instrumentation, Wiley Eastern Ltd, New Delhi, 1990.
2. Ogata, K., Modern Control Engineering, Prentice Hall, 1995.
3. Benjamin C. Kuo., Digital Control Systems, Oxford University Press, 1992.
4. Stefani R.T, Shahian B, Savant J.C and Hostetter G. H, Design of Feedback Control Systems, Oxford University Press, 2002.



FS-0604 FIRE ENGINEERING III

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS 0604	FIRE ENGG.III	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Fire detection-need and importance of automatic fire detections system principle of detection.Classification of detectors : Heat detectors fixed temperature, rate of rise, thermistor rate of rise and rate compensated type detectors; Smoke detectors-optical and ionization type, photo electric light scattering and light obstruction type detectors; Flame detectors-infrared and ultraviolet detectors; Flam mileages detection- Elliston and laser detectors; Testing of fire detection devices as per relevant Indian standards(ISI); Comparison of detectors; Performance characteristics of detectors; Lag time associated with fire detection.

UNIT-II

Marks : 16

Principles of Fire Extinguishments-extinction of premixed flames, diffusion flames and burning metals, fire triangle, fire tetrahedron; Basic concept of fire fighting with water, carbon dioxide, powders, foams, inert gases hallons; Need for alone placement and halo substitutes; Extinguishment performance-flame extinguishing concentration, inverting concentration, fire trials. First aid fire protection-fire bucket sand bucket, fire blanket, fire pails & water barrels, hose reels; Description, working principle, method of operation of different types of portable fire extinguishers water type, foam type, dry powder type, CO₂ type, vaporizing liquid type; Care, inspection, and maintenance of portable extinguishers;

UNIT-III

Marks : 16

Automatic water sprinkler system- requirement and source of water supply, automatic pumps; Automatic sprinkler heads-Quart zoid type, fusible link type, modern types; mounting and protection of sprinkler heads; sprinkler pipe works-standard and staggered layout, hangers; Control valves for wet and dry installations; deluge valve. Drenchers; High velocity and medium velocity spray system;

UNIT-IV

Marks : 16

Principles of sprinkler system design as per relevant standards(ISI).Fixed fire fighting system using CO₂, Dry chemical powder, and Foam- concept of total flooding and local application, advantages and disadvantages of each system; Basic system components; Design principles of fixed fire fighting systems for total flooding and for local application as per relevant standards(ISI).

UNIT-V

Marks : 16

Fire alarm system-classification of alarm system as per NBC; Manually operated system; Automatic alarm system; Component and features of Local system, Auxiliary system, Remote station system, Central station system and Proprietary system Fire ground operations-preplanning, action on arrival and control, methods of rescue, methods of entry. Personnel safety. Control procedure and use of other safety equipment. Ventilation and salvage operations.

Swami Vivekanand University, Sagar(M.P.)

Text Books

1. Ron Hirst, "Underdowns Practical Fire Precautions", Gower Publishing Company Ltd., England, 1989.
2. Jain V.K., "Fire Safety in Buildings", New Age International (P) Ltd., New Delhi, 1996
3. Clark, W.E., "Firefighting principles & practices",
4. HMSO: Manual of Firemanship, No. 4 to 7.

Reference Books

1. Kevin Cassidy, "Fire Safety and loss Prevention",
2. NFP A, "Fire Protection Handbook",
3. Hubert Walker, "Preventive maintenance/Apparatus",
4. Ervin L. W., "Firefighting apparatus and procedures",
5. Fire services manual Vol 1 & Vol 2

List of Experiments (Pl. expand it):

1. Study of automatic fire detection system
2. Study of Automatic water sprinkler system
3. Study of all personal protection equipments.
4. Study of Fire Tender
5. Study of CO2 flooding system
6. Study of Foam system
7. Study of Fire triangle and all controlling process.
8. Study of all types of extinguishers.



FS-0605 OCCUPATIONAL HEALTH AND HYGIENE MANAGEMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Mi n (f)				
BTFS -0605	OCCUPATIONAL HEALTH & HYGIENE MANAGEMENT	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT-I

Marks : 16

Concept and spectrum of health- functional units and activities of occupational health e services- occupational and work related disease- Levels of prevention of diseases - notify able occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracnose, aluminizes and anthrax- Lead- Nickel, chromium and manganese toxicity-gas poisoning(such as CO, ammonia, coal and dust), their effects and prevention-Industrial toxicology-local and systemic and chronic effects, temporary and cumulative effects - threshold limit values, calculation of TLVs - carcinogens, mutagens, dermatogens.

UNIT-II

Marks : 16

Recognition, evaluation and control of physical hazards. Vibration-description and measurement of vibration. Vibration control methods. Effects of whole body vibration on human body and control measures. Noise-noise measurement, evaluation, noise control methods-hearing loss-causes-Biological effects of noise exposure.

UNIT-III

Marks : 16

Thermal stress-heat disorders and heals the effects such as heated exhaustion, head rcrampetc. WBGT index, acclimatization. Ventilation systems –purpose of ventilation-general principle ventilation requirements. Physiological and comfort level. Natural ventilation-Dilution ventilation-Mechanical ventilation- Local exhaust ventilation - Ventilation measuring instruments. Fundamentals of hood and duct designs. Standards on ventilation

UNIT-IV

Marks : 16

Man as a system component-allocation of functions-efficiency-occupational work capacity-aerobic and an aerobic work-steady state-evaluation of physiological requirements of jobs-parameters of measurements- categorization of job heaviness- work organization-stress-strain-fatigue-rest pauses--audio metric test- hearing conservation programmed-vision test- vital function test- pre-employment and periodic employment medical examinations. Biological rhythms, shift work and occupational health.. Purpose of lighting. Advantages of good illumination. Lighting and the work. Sources and kinds of artificial lighting principles of good illumination. Design of lighting installation. Maintenance. Lighting and color. Standards on lighting and illuminations

UNIT-V

Marks : 16

Biological hazards- agents- types sources and prevention. Recognition, evaluation and control of chemical hazards-types-dust-fumes-mist-vapor- fog etc., air contaminants- evaluation- types of sampling - air sampling system-methods of analysis-control measures. Ionizing and no ionizing radiation, Radiation protection. Instruments for Radiation detection and measurement. Early recognition of radiation hazard-personal monitoring devices, Medical support. Hazards associated with the following radiations and preventive measures- Laser, infrared, ultraviolet and ELF. Personal protection in the working environment, Types of PPEs, Personal protective equipment respiratory and non respiratory equipment. Standards related to PPEs.



REFERENCES

1. Encyclopaedia of Occupational Health and Safety : Vol I & II - ILO
2. Industrial Environment and its evaluation and control : NIOS
3. D Hunter, Diseases of Occupation.
4. M. K. Polte, Occupational Health & Safety in manufacturing industries.
5. Clayton & Clayton, Patty's Industrial Hygiene and Toxicology

List of Experiments (Pl. expand it):-

- 1 Activities of occupational health services- occupational and work related disease
- 2 Effects of whole body vibration on human body and control measures
- 3 Thermal stress-heat disorders and health effects such as heat exhaustion,
- 4 Standards on lighting and illuminations
- 5 Biological hazards- agents- types sources and prevention



FS-0606 PROJECT REPORT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0606	PROJECT REPORT	-	-	2	2	0	0	0	0	0	0	-	50	50	3 Hrs



FS-0607 MINOR PROJECT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0607	MINOR PROJECT	-	-	4	4	0	0	0	0	0	0	-	50	50	3 Hrs

Each batch comprising of around 5 students shall identify a project related to the curriculum of study. At the end of the semester, each student shall submit a projected port comprising of the application and feasibility of the project.

Guide lines for evaluation:

1.Attendanceandregularity	20
2.Theoreticalknowledgeandindividualinvolvement	30
3.Qualityandcontentsofprojectreport	30
4.Presentation	20



FS-0608 SEMINAR

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0608	SEMINAR	-	-	4	4	0	0	0	0	0	0	-	50	50	3 Hrs



FS-0701 HAZARD IDENTIFICATION AND RISK ASSESSMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			M a x	Min (f)				
BTFS -0701	HAZARD IDENTIFICATION & RISK ASSESSMENT	3	1	0	4	80	25	20	100	50	15	-	50	200	3 Hrs

UNIT- I

Marks : 16

Hazard and risk, Types of hazards-fire, explosion and toxic gas release, Structure of hazard identification and risk assessment. Identification of hazards: Inventory analysis, Fire and explosion hazard rating of process plants- The Dow Fire and Explosion Hazard Index, The Mond Index, Plant layout and unit the hazard rating, Preliminary hazard analysis, Hazard and Operability study(HAZOP), What I analysis, Case studies.

UNIT- II

Marks : 16

Plant availability and process reliability: ways of improving plant availability, MTBF and MTTF, the reliability function, failure rate, bathtub curve, probability relationships, simple reliability estimation. Estimation of frequency of occurrence of a hazard: The logic tree approach set theorem and Boolean algebra, application to probability, Boolean manipulation.

UNIT- III

Marks : 16

Fault tree analysis-logic symbols, minimal cut set, logic gates, fault tree quantification. Event tree analysis-notation, event tree construction, advantages and disadvantages of FETA. Failure mode and Effect Analysis(FMEA) - methodology, criticality analysis, corrective action and follow-up.

UNIT- IV

Marks : 16

Consequence modeling: Source models-discharge rate models, flash and evaporation, dispersion models. Explosions and fires-vapor cloud explosions, flash fires, physical explosions, BLEVE and fireball, confined explosions, pool fires, jet fires. Effect models-dose-response functions, probit functions, toxic gas effects, thermal effects, explosion effects- Software application for effect and damage calculations.

UNIT- V

Marks : 16

Quantification of risk: QRA, Vulnerability analysis, accepted and imposed risk, perception of risk, risk indices, individual risk and societal risk, acceptance criteria for risk, ALARP, Presentation of measures of risk-risk contour, F-Curve. Calculation of individual risk and societal risk. Humane liability analysis(HRA): factors leading to human error, characteristics of HRA techniques, Technique for Human Error Rate Prediction(THERP), Accident Sequence Evaluation Program (ASEP), Techniques using expert judgment, Operator Action tree(OAT).



Text Books

AICHE/CCPS, Guidelines for Hazard Evaluation Procedures second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 1992.

AICHE/CCPS, Guidelines for Chemical Process Quantitative Risk Analysis second edition. Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York, 2000.

References

1. Lees F.P. Loss Prevention in the Process Industries second edition. Butterworth's, London, 1996

List of Experiments:

1. Demonstration and calibration of Air sampling equipment
2. Sampling and estimation of gases in work environment by a Lorrimer method
3. Sampling and estimation of solvent vapours in work environment
4. Sampling and estimation of dust-gravimetric method
5. Noise level measurement-Sound level meter, Octave filter set
 - a) Measurement of sound pressure level in db A and db linear
 - b) Frequency analysis of noise
6. Measurement of illumination level
7. Study of lungs models
8. Study of occupational diseases with photographic models
9. Demonstration of medical laboratory equipments
10. Thermal stress analysis



FS-0702 SAFETY IN RAIL AND ROAD TRANSPORT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0702	SAFETY IN RAIL & ROAD TRANSPORT	3	1	2	6	80	25	20	100	-	-	-	100	100	3 Hrs

UNIT-I

Marks : 16

Railway Engineering: Permanent way-Components: Rails-Functions, requirements, defects, Rail joints and Fast endings, check and guard rails, coning of wheels, creep of rails; Sleepers-functions, requirements, types, density; Ballast-functions, requirements, types. Geometric Design-Horizontal curves, Super-elevation, Negative super-elevation in branches, Length of transition curves-Grade compensation on curves-Widening of gauge on curves

UNIT-II

Marks : 16

Rail way operation & control: Points and crossings- Turn-out-Types of Rail way tracks-Points Station Yards and Marshalling Yards-Signaling and inter locking-Principles of track circuiting Control of train movement by centralized traffic control system. Railway Accidents & Safety. Rapid Transit Railways-types, merits & demerits

UNIT-III

Marks : 16

Classification of highways-Typical cross-section of roads- Definition of various cross-sectional elements- Requirements & factors controlling alignment of roads- Basic geometric design of streets and highways

UNIT-IV

Marks : 16

Traffic characteristics-various traffic studies and their applications-Traffic signals- Classification of signals- Carriage-way markings- Traffic islands- Highway intersections- Principles of highway lighting

UNIT-V

Marks : 16

Accident prevention, investigation and reduction- Road Accidents- Regulatory measures for traffic management- Physical methods of traffic control- Traffic Calming- Safety Audit, Intelligent Transport System.

References:

- 1.S.C.Rangwala,RailwayEngineering
- 2.S.K.KhannaandC.E.G.Justo,Highway Engineering
- 3.L.R.Kadiyali,TrafficEngineeringandTransportPlanning.
- 4.MikeSlinn,PeterGuestandPaulMathews, Traffic EngineeringDesign: Principles and Practice, Butterworth-HeinemannElsevier.
- 5.R.Agor,RailwayTrackEngineering,KhannaPublishers.



FS-0703 SAFETY IN ENGINEERING INDUSTRY

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Mi n (f)				
BTFS-0703	SAFETY IN ENGINEERING INDUSTRY	3	1	2	6	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT-I

Marks : 16

Introduction-Classification of Engineering Industry-Manufacturing Processes Hot Working-Foundry operations-furnace and equipments, health hazard, safe methods of operation. Forging operations, heat radiation, maintenance of machines, shop equipments and hand tools-safe work practice. Operations in hot and cold rolling mills.

UNIT-II

Marks : 16

Machinery safe guard-Point-of-Operation, Principle of machine guarding – break down of machine guarding-types of guards and devices

UNIT-III

Marks : 16

Cold Working-Safety in Power Presses, primary & secondary operations-shearing-bending-rolling-drawing. Metal Cutting-safety in turning, boring, milling, planning and grinding. Maintenance of machine tools-health hazards and prevention.

UNIT-IV

Marks : 16

Welding and Cutting-Safety Precautions of Gas welding and Arc Welding, Cutting and Finishing. Gas Cylinders and Equipments. Heat Treatment- Furnaces and Salt baths- operations and maintenance-safety in handling and storage of salts-disposal of effluents- health precautions, exposure to hazardous fumes, source of fumes, ventilation and fume protection

UNIT-V

Marks : 16

Material Handling-Classification-safety consideration-manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling Equipments-operation & maintenance. Maintenance of common elements- wire rope, chains slings, hooks, clamps

Reference

1. Accident Prevention Manual for Industrial Operations: National Safety Council, Chicago
2. Roland P. Blake, Industrial Safety
3. NCBalchin, Health and Safety in Welding and Allied process, Juice Publishers
4. N. Srinivasan, Safety in Engineering Industry, Vijay Consultant Services, Chennai
5. S. Kalpakjian and S.R. Schmid, Manufacturing Engineering and Technology, Pearson Education Asia



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FS-0704 FIRE ENGINEERING IV

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0704	FIRE ENGINEERING IV	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT- I

Marks : 16

Process of emergency evacuation-special features of personnel movement. Parameter characteristics of the Movement of people-practical methods of designing evacuation passages and exists. Evacuation exits and routes-stages of evacuation; Exit Requirements-Planning of evacuation routes and exits-Seating arrangement- Passages and corridors; Smoke control during building design; Mechanical Ventilation; Compartment fires and tactical ventilation.

UNIT- II

Marks : 16

Classification of building based on occupancy; Fire zone; classification of type of construction according to fire resistance; General fire safety requirements applicable to all individual occupancies. Sitting of detectors as per event standards(ISI); Selection and planning of alarm system as per relevant standards(ISI). General requirements and guidelines for the installation of fire detection and alarm system in buildings of different occupancy classification.

UNIT- III

Marks : 16

General exit requirements as per NBC; Internal stair cases; Pressurization of stair cases; horizontal exits; fire Tower ;ramps; fire lifts; external fire escape ladders; Planning of location and calculation of capacity, number and width of exit as per NBC for different occupancy classification.

UNIT- IV

Marks : 16

Selection and distribution of portable extinguishers (for class A and B fires) and other fire protection equipments and systems for different occupancy classification as per NBC; Planning of fixed fire fighting installation for different occupancy classification-sprinkler system; total flooding system; CO₂ system; foam system;

UNIT- V

Marks : 16

Fire training and education- Arson- Fire safety audits- Risk assessment- Fire insurance. Fire Investigation

Text Books

1. Roytman M. Ya., "Principles of Fire Safety Standards for Building Construction", Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975
2. E. Gordon Butcher E. G. and Parnell A. C., "Designing off fire safety", John Wiley and Sons Ltd., New York, U.S.A., 1983.
3. BIS, "NBC Part 4-Fire and Life safety", Bureau of Indian Standards, New Delhi, 2005.

Reference Books

1. Marchant E. W., "A Complete Guide to Fire and Building",
2. Adam and Charles Black, "Fire safety in Buildings",

List of Experiments:

1. Determination of flash Point, fire point and pour point of hydrocarbons.
2. Test on Dry Chemical Powder
 - a. Apparent Density Test
 - b. Hygroscopicity Test
 - c. Caking Test
 - d. Water Repellency Test
 - e. Heat Test
 - f. Efficient Fluidity Test
 - g. Fire Knocking Down Property Test
 - h. Foam Compatibility Test
3. Performance Tests on Portable DCP Fire Extinguishers (Cartridge Type)
4. Performance Tests on Portable and Trolley mounted Fire Extinguishers CO₂ Type.
5. Tests on Foam
 - a. P H value
 - b. Sludge content
 - c. Specific Gravity
 - d. Miscibility
 - e. Freezing Point
 - f. Film Formation Test
 - g. 25% Drainage Time
 - h. Burn-back Resistance
 - i. Fire Extinguishing Property
6. Test of non-combustibility of Building Materials
7. Study of fire fighting equipments and accessories.



705(A) AUTOMOBILE ENGINEERING & SAFETY

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS - 0705(A)	AUTOMOBILE ENGG. & SAFETY	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT -I-

Marks : 16

Types of automobiles. Limiting Dimensions as per Central Motor Vehicles Rules. Engines-Classification, Construction, Materials of engine components. Proto type Testing as per Central Motor Vehicles Rules. Fuel System -Fuel tank, Fuel filter, Types of Fuel system Carburetor -Simple and Modern, Fuel injection System. Emission Standards as per CMV Rules.

UNIT-II

Marks : 16

Electrical System-Storage Battery Operations and Maintenance. Ignition System-Coil And Magneto Ignition System. Starting System, Lighting System, Horn System- Wind Shield Wiper Motors, Fans, Heaters, Eradicators. Automobile air-conditioning. Central Motor Vehicles Rules regarding Lighting, Wind shields, Wipers

UNIT-III

Marks : 16

Transmission System-Clutches- operation and fault finding of clutches, Fluid Flywheel, Gear Box-types, Steering Systems, Chassis Springs, Suspension. Differential, Dead and Live axles, Rims, Type etc. Brakes-Types, construction and fault finding. CMV Rules-Brakes, Steering & Type.

UNIT-IV

Marks : 16

Lubrication Systems- Types, Components, Lubricating oil, Cooling system- Details of components, Study of Systems, Types.

UNIT-V

Marks : 16

Miscellaneous-Special gadgets and accessories for fire fighting vehicles. Automobile accidents.CMV Rules regarding Safety devices for drivers, passengers



References:-

1. William H. Crouse, Automobile Chassis and Body Construction, Operation and Maintenance.
2. William H. Crouse, Automobile Machines-Principles & Operations.
3. GBS Narang, Automobile Engineering
4. Kirpal Singh, Automobile Engineering
5. Joseph Heitner, Automotive Mechanics-Principles & Practices
6. P.L. Kohli, Automotive Electrical Equipments.
7. The Central Motor Vehicles Rules, 1989

List of Experiments:

1. Study of Automobiles Limiting Dimensions as per Central Motor Vehicles Rules
2. Study of Types of Fuel system Carburetor -Simple and Modern
3. Study of Automobile air-conditioning
4. Study of Transmission System
5. Study of Lubrication Systems



705(B) SAFETY IN PETROLEUM & PETROCHEMICAL INDUSTRIES

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS-0705(B)	SAFETY IN PETROLEUM & PETROCHEMICAL INDUSTRIES	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT- I

Marks : 16

Simplified flow diagrams of a typical refinery- distillation unit, catalytic cracker, reformer, treating unit (hydro forming, gas purification, Sulphur recovery, lubricating oil unit) Simplified flow diagrams of Petro chemical Industry-steam cracking, butadiene extraction, ethane recovery, butyl rubber polymerization.

UNIT- II

Marks : 16

Potential fire hazards in petroleum and petrochemical industries(ignition by local sources, spark, flame, hot surface, ignition of oil mists and fumes.). Storage tank farms of petroleum and petrochemical industries- Identification of Hazards, Type of Tanks, Design, Layout, Fire prevention measures including lightning protection

UNIT- III

Marks : 16

Fire protection arrangements in large tank farms, Design concepts of various fixed fire protection systems like Foam-Water Systems, Halogen& DCP systems. Lock out procedures. Salient features of codes/standards: NFPA,API, OISD and SHELL.

UNIT- IV

Marks : 16

Fire protection facilities in Oil Refineries, Depots & Terminals-Transportation of petroleum and petrochemical products(safety considerations, statutory considerations). Design and Construction requirements for cross country hydro carbon pipe lines. Liquefied Petroleum Gas(LPG)Bottling Plant Operations. Design Philosophies. Operating Practices-Safety and Fire Protection in bottling plants. Internal Safety Audits in(Procedures and Checklist) Transportation of Bulk Petroleum Products. Storage and Handling of Bulk Liquefied Petroleum Gas.

UNIT- V

Marks : 16

On-Shore and Off-shore drilling. Classification of wells. Drilling method. Rotary drilling. Drilling equipment. Ground and off shore structures for drilling. Off shore platforms and drilling vessels. Drilling mud - functions, classification and properties. Blow-off, well kicks, Blow out preventer. Shallow gas. Directional drilling. Well killing procedure. Emergency shut down, Methods of Rescue & Fire Fighting.



References:-

1. Frank P Lees: Loss prevention in Process Industries-Vol. I, II & III, Butterworth-Heinemann Publishing Company, UK.
2. Manual of Firemanship-Vol. I to XIII, HMSO, London.
3. Fire Protection Handbook.
4. OISD guidelines.

List of Experiments:

1. Study of Simplified flow diagrams of a typical refinery
2. Study of Potential fire hazards in petroleum and petrochemical industries
3. Study of Design concepts of various fixed fire protection systems
4. Study of Transportation of petroleum and petrochemical products
5. Study of Emergency shut down, Methods of Rescue & Fire Fighting



FS-0706 INDUSTRIAL HYGIENE LAB

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS-0706	INDUSTRIAL HYGIENE LAB	3	-	2	4	-	-	-	-	-	-	50	50	50	3 Hrs

1. Demonstration and calibration of Air sampling equipment
2. Sampling and estimation of gases in work environment by a Lorrain method
3. Sampling and estimation of solvent vapours in work environment
4. Sampling and estimation of dust-gravimetric method
5. Noise level measurement-Sound level meter, Octave filter set
 - a) Measurement of sound pressure level in db A and db linear
 - b) Frequency analysis of noise
6. Measurement of illumination level
7. Study of lungs models
8. Study of occupational diseases with photographic models
9. Demonstration of medical laboratory equipments
10. Thermal stress analysis



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FS-0707 INDUSTRIAL TRAINING

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0707	INDUSTRIA TRAINING	-	-	2	2	0	0	0	0	-	-	50	50	50	3 Hrs



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FS-0708 MINOR PROJECT II

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0708	MINOR PROJECT II	-	-	4	4	0	0	0	0	50	15	50	100	100	3 Hrs



801 HUMAN FACTORS ENGINEERING

Course Code	Title of the Paper	Periods Per				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS 0801	HUMAN FACTORS ENGINEERING	-	-	2	2	-	-	-	-	50	15	50	100	100	3 Hrs

UNIT-I

Marks : 16

Human factors- objectives and approach. Systems thinking- human-machine systems, characteristics of systems, system reliability. Human beings as information processors-information theory, displaying information, coding of information, characteristics of good coding system, compatibility, types of compatibility, perception, memory, decision making, attention, age and information processing, mental work load and its measurement.

UNIT-II

Marks : 16

Process of seeing, visual capabilities, accommodation, visual acuity, contrast sensitivity, factors affecting visual acuity and contrast sensitivity, adaptation, color discrimination, perception. Design of hard copy and VDT screens. Graphic representations-symbols, objectives and criteria for selection, perceptual principles of symbolic design. Codes-dimension, colour. Design of dynamic information displays, uses of dynamic information, design of quantitative visual displays, design of qualitative visual displays, design of signal and warning lights, recommendations regarding signal and warning lights, representational displays, head-up displays. Hearing, nature and measurement of sound, complex sound, anatomy of ear, conversion of sound waves to sensations, masking. Auditory displays, detection of signals, relative discrimination and absolute identification auditory signals, sound localization, principles of auditory display, coetaneous senses, tactual displays, substitutes for hearing and seeing, oil factory senses and displays.

UNIT-III

Marks : 16

Physical work-muscle physiology, work physiology, measures of physiological strain, physical work load, Work efficiency, energy consumption, grades of work, factors affect in energy consumption, controlling energy expenditure, strength and endurance, measurement of strength, factors affecting strength. Manual material sandling-lifting tasks, carrying tasks, pushing tasks, limits of MMH tasks, reducing risks of MMH over exertion. Motor skills-bio mechanics of human motion, types of body movements, range of movements, classes of motor movements, Speed of movements-reaction time, movement time, accuracy of movements. Human control of systems-compatibility, spatial compatibility, movement compatibility. Supervisory control. Controls devices- functions of control, factors in control design. Principles of hand tool and device design.

UNIT-IV

Marks : 16

Work place design- anthropometry, static dimensions, dynamic dimensions, principles in the application of anthropometric data. Work spaces - work-space envelopes for sitting and standing personnel, out-of-reach and clearance requirements. Design of work surfaces. Science of seating – general principles of seat design. VDT work stations.

UNIT-V

Marks : 16

Arrangement of components with in a physical space –principles of arranging components, Method loges for arranging components, types and uses of various data, link diagrams, general location of various controls and displays within work space, specific arrangements of controls and displays with in workspace, spacing of control devices. General guidelines in designing individual work places.

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TEXT BOOK & REFERENCE

1. Sanders,M.M.&McCormick,E.J,
2. Human Factors in Engineering & Design 7thed. McGraw-HillInternationalEdition,1993.
3. Martin Hollander, A Guide to Ergonomics of Manufacturing, TMH, 1996.

List of Experiments:

1. Study of Human factors- objectives and approach.
2. . Study of Design of dynamic in formation displays
3. Study of Principles of hand tool and device design.
4. Study of VDT work stations.
5. Study of specific arrangements of controls and displays with in workspace



802 DISASTER MANAGEMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0802	DISASTER MANAGEMEMENT	3	1	0	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT-I

Marks : 16

Importance of disaster management for chemical industry- Types of emergencies- major industrial disasters- causes and consequences of major industrial disasters like Bhopal, Sagar and Bhopal. Components of a major hazard control system- identification of major hazard control installations- purpose and procedures-safe operation of major hazard installations-mitigation of consequences- reporting to authorities. Implementation of major hazard control systems- group of experts- training- checklists- inspection-evaluation of major hazards- information to the public-man power requirements-sources of Information

UNIT- II

Marks : 16

Emergency planning-on-site and off-site emergency plan-need of plan-possible approach-Objectives of emergency plan. On-site emergency planning- formulation of the plan and emergency services – Identification of resources-actions and duties- emergency procedure-mock drills. Off-site emergency planning- objectives and elements of off-site plan - role of administrative machinery- role of major hazard works management- role of the local authority.

UNIT- III

Marks : 16

Emergency preparedness at local level- Awareness and preparedness for emergencies at local level(APELL)-The process and its partners

UNIT- IV

Marks : 16

Requirements of emergency plan as per Indian legislations like Factories Act, Manufacture, Storage and Import of Hazardous Chemicals Rules, Chemical Accidents (Emergency planning, Preparedness and Response) Rules. Emergency planning and preparedness in international standards like ISO14001, OHSAS18001 and OSHA's Process Safety Management System, Emergency Planning in Selves II directive -elements of emergency planning in IS:18001- Hazardous Materials/Spills Emergencies-contingency plans for road transportation of hazardous chemicals - contingency plans for oil spills in marine Environment

UNIT- V

Marks : 16

Natural Hazards – potentially hazardous natural phenomena - earthquakes- landslides-flooding - cyclones- hazards in arid and semi-arid areas-nature of the hazard-hazard management activities- disaster mitigation natural hazard prediction-emergency preparedness-disaster, rescue and relief- post disaster rehabilitation and reconstruction- education and training activities-vulnerable elements to be considered in the development planning for natural hazard management-applications of remote sensing and GIS in disaster management

References:-

1. ILO, Geneva: Major Hazard Control-a Practical Manual.
2. UNEP, Paris: APELL- A Process for responding to technological accidents, A Handbook, Industry & Environment Office. 1998
3. Accident Prevention Manual for Business and Industry, Vol. I-National Safety Council, USA.
4. Oil spill Response : The National Contingency Plan –Institute of Petroleum, London
5. Petak, W.J and Atkinson, A.A.: Natural Hazard Risk Assessment and Public Policy : Anticipating the Unexpected
6. U.R.Rao: Space Technology for Sustainable Development



803 ADVANCED SAFETY ENGINEERING AND MANAGEMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
						Max (a)	Min (b)			Max (e)	Min (f)				
BTFS -0803	ADVANCE SAFETY ENGINEERING & MANAGEMENT	3	1	-	4	80	25	20	100	-	-	-	-	100	3 Hrs

UNIT-I

Marks : 16

Domino incident in visitation- technique, logic diagram, input requirements, output, example. Unavailability analysis of protective systems-technique, logic diagram, input requirements, example. Reliability analysis of automatic control systems- PES safety system development logic diagram, system analysis, calculation of fractional dead time, application, strengths and weaknesses. Introduction to MORT analysis, IFAL analysis, Markov processes and application of Markov modeling to safety instrumented systems, Sneak analysis.

UNIT- II

Marks : 16

Environmental risk assessment- Human health risk assessment(HHRA), Ecological risk assessment(ECRA), Receptor, stressor and exposure. Steps in ECRA-identification of potential sites, Identification and characterization of stressors identify in receptors, identification of potential ecological effects, selection of assessment and measurement end points, developing a conceptual model and risk hypotheses, approach for risk assessment.

UNIT- III

Marks : 16

Security for chemical process industries- Assessments and regulatory environment, methods for assessing security vulnerability, emerging security regulations, government development and industry activities that relate to security for process facilities.

UNIT- IV

Marks : 16

Strategies and counter measures-prevention of intentional releases and theft of chemical releases at process facilities. Site security for process industries-Essential elements-threat analysis, security counter measures, mitigation and emergency response. Specific security measures-information security, cyber security, physical security, policies and procedures, training, mitigation and response, inherently safer processes. Case study.

UNIT-V

Marks : 16

Safety Management Systems: SHEMS, OHSAS18001 and OSHA's PSM-Policy, planning, training, implementation, management control and review. Layer of Protection Analysis (LOPA)- Over view of relevant standards and guidelines, risk tolerance criteria. Preparation of LOPA-LOPA methodology, the LOPA team. Scenario development - components, in fervently safe consideration Initiating causes/effects-identification, estimation of frequencies. Independent protection layers - IPL criteria, allocation of IPL credit -basic process control systems, operator response, pressure relief device, safety instrumented system, safety instrumented function. Safety integrity level (SIL) assignment, Interpreting LOPA results and making recommendations.

Text Books and References

1. Centre for Chemical Process Safety, AIChE :Guide lines for Chemical Process Quantitative Risk Analysis, second edition, 2000.
2. ACC: Site Security Guide lines for the U.S Chemical Industry, American Chemistry Council, Washington DC, 2001.
3. Jotter week, Ecological impact assessment, Black well Science, 1999.



BTFS-0804 ELECTIVE II

FS-0804(A) SAFETY IN POWER PLANTS

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Mi n (f)				
BTFS-0804	SAFETY IN POWER PLANTS	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT- I

Marks : 16

Introduction, Generation of electricity and sources of energy, Principal types of power plants. Power plant capacity. Principles of power plant design. Solid, liquid and gaseous fuels, storage of fuels, Hazards in the storage of fuels. Safety precautions in storage and handling. Combustion and combustion equipment-safety in furnace operations- Effect of service conditions on refractories.

UNIT- II

Marks : 16

Steam generator, types and safety measures- Dust collectors- Selection of site for steam plant. Layout. The diesel engine plant: use of diesel engine in a steam plant. Advantages and disadvantages of diesel plants. Safety and environmental problems of diesel plants.

UNIT- III

Marks : 16

Principle of operation of hydro electric power plants. Installation of power plant. Safety during selection of power plant equipment-safety in commissioning of thermal power plant equipments, hydro static and air leakage test, acid and alkali leaning, safety in auxiliary plants. Cooling water system. Safety in maintenance of power plants.

UNIT- IV

Marks : 16

Nuclear Energy, Parts of a nuclear reactor, Classification of reactors, Design of nuclear reactors. Main components of a nuclear power plant. Boiling water reactor, Pressurized water reactor, Sodium graphite reactor, Fast breeder reactor. Light water reactors and Heavy water reactors. Power of a nuclear reactor. Safety measures for nuclear power plants. Non-conventional sources of energy

UNIT- V

Marks : 16

Effective utilization of solar energy, Energy from high velocity winds, Geo thermal, Tidal and ocean thermal sources of energy.



Text books:

- 1.P.K.Nag,"PowerPlantEngineering",TataMcGrawHillPublishingCo.Ltd.,1998.
- 2.JohnVGrimaldiandRollinHSimonds.,SafetyManagement

References:

- 1.S.C.AroraandS.Domkundwar,"A CourseinPowerPlant Engineering",
DhanpatRaiandSons,TataMcGraw Hill,1998.
- 2.G.R.Nagpal,"PowerPlantEngineerig",KhannaPublishers,1998.
- 3.JoelWeismanandRoyEckart,"ModernPowerPlant Engineering",PrenticeHall
InternationalInc,1985.

List of Experiments:

1. Study of Safety precautions in storage and handling
2. Study of safety in furnace operations- Effect of service conditions on refractories
3. Study of Steam generator, types and safety measures
4. Study of Safety and environmental problems of diesel plants
5. Study of safety in commissioning of thermal power plant equipments
6. Study of Safety measures for nuclear power plants.



FS-804(B) SAFETY IN HEALTH CARE WASTE MANAGEMENT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Mi n (f)				
BTFS-0804(B)	SAFETY IN HEALTH CARE WASTE MANAGEMENT	3	1	2	6	80	25	20	100	50	15	50	100	200	3 Hrs

UNIT- I

Marks : 16

Definition & characterization of health-care waste- sources and generation of waste, Physics chemical characteristics. Hazards of health- care waste, public health impacts of health care waste. Health-care waste management planning- waste management plan for health care establishments, management of health-care waste from scattered small sources, waste minimization, recycling and reuse.

UNIT- II

Marks : 16

Handling, storage and transportation of health-care waste –waste segregation and Packaging, on site collection, transport and storage of waste, off site transportation of waste.

UNIT- III

Marks : 16

Treatment and disposal of health care waste-Incineration chemical disinfection; wet and dry thermal treatment, Microwave irradiation, land disposal, Initiation.

UNIT- IV

Marks : 16

Treatment and disposal methods - Infectious waste and sharps, pharmaceutical waste, cyto toxic waste, chemical waste, wastes with high heavy-metal content, pressurized containers-radio active waste. Collection and disposal of waste water-hazards of waste water from health care establishments-waste water management. Workers protection, cyto toxic safety, Emergency response.

UNIT- V

Marks : 16

Epidemiology of nosocomical infections and prevention. Training for health care personnel and waste management operators. Minimal programmes for health care waste management - waste segregation, safe recycling, treatment & disposal, management of hazards health-care waste by waste categories.



References:-

- 1) APruss,E.GiroultP.Rushbrook(Ed.) : SafeManagementofWastefrom health-care activities.WorldHealthOrganization,Geneva

List of Experiments:

1. Study of sources and generation of waste
2. Study of off site transportation of waste.
3. Study of Treatment and disposal methods
4. Study of Training for health care personnel and waste management operators
5. Study of safety in transportation.



FS-0805 SEMINAR & GROUP DISCUSSION

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS -0805	SEMINAR & GROUP DISCUSSION	-	-	2	4	-	-	-	-	-	-	50	50	50	3 Hrs



FS-0806 MAJOR PROJECT

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
		L	T	P	C	Theory		MST (c)	Total (d = a+c)	Practical		T W (g)	Total (h= e+g)		
						Max (a)	Min (b)			Ma x (e)	Min (f)				
BTFS 0806	MAJOR PROJECT.	-	-	10	10	-	-	-	--	200	60	100	300	300	3 Hrs



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