*Faculty of Engineering & Technology*

*P.K.University*

*Shivpuri (MP)*


# Evaluation Scheme & Syllabus of
# Department of Agriculture Engineering Syllabus
# B.Tech- AG
# First Year I & II Semester

**(Effective from session 2019-20)**

**(Taken From Abdul Kalam Technical University-AKTU)**

# EVALUATION SCHEME

## SEMESTER I

| | | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| **SUBJECT CODE** | **SUBJECT NAME** | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG-101 | Engineering Math-I | 30 | 70 | NA | NA | 100 |
| BTAG -102 | Engineering Physics | 30 | 70 | 25 | 25 | 150 |
| BTAG -103 | Basic Electrical Engineering | 30 | 70 | 25 | 25 | 150 |
| BTAG -104 | Professional communication | 30 | 70 | 25 | 25 | 150 |
| BTAG -105 | Elementary Agriculture | 30 | 70 | NA | NA | 100 |
| | | | | | | |

## SEMESTER II

| | | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| **SUBJECT CODE** | **SUBJECT NAME** | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG -201 | Engineering Math -II | 30 | 70 | NA | NA | 100 |
| BTAG -202 | Engineering Chemistry | 30 | 70 | NA | NA | 100 |
| BTAG -203 | Elements of Mechanical Engg. | 30 | 70 | 25 | 25 | 150 |
| BTAG -204 | Fundamental of Computer Programming | 30 | 70 | 25 | 25 | 150 |
| BTAG -205 | Surveying & Leveling | 30 | 70 | 25 | 25 | 150 |

# *Department of Agriculture Engineering*
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# *P.K.University, Shivpuri (MP)*
## *I Year I Semester*

### BTAG -101: ENGINEERING MATH - I

**Unit - 1: Statistical Technique:**

- Introduction.
- Measures of central tendency: Mean median & mode.
- Mean deviation.
- Standard deviation.
- Skewness.
- Karl Pearson's coefficient of skewness.
- Principle of Least square.

**Unit - 2: Elementary Differentiation:**

- Definition.
- Limit and continuity.
- Derivatives of some standard functions.
- Derivatives of sum and difference.
- Derivatives of product and quotient of functions.
- Derivatives of composite functions and chain rule.
- Logarithmic differentiation.
- Parametric differentiation

**Unit - 3: Taylor's and Maclaurin's series for one variable (without proof).**

- Indeterminate forms
- Curvature: Cartesian formula for radius of curvature.
- Asymptotes for Cartesian coordinates only.

**Functions of two or more independent variables:**

- Partial differentiation.
- Homogeneous functions and Euler's theorem.
- Total differentiation and Change of variables.
- Jacobians.
- Maxima and minima (simple problems only) .

**Unit - 4: Elementary Integration:**

- Integration as inverse process of differentiation.
- Integration of some standard functions.
- Integration by substitution.
- Integration by parts.
- Integration by partial fraction.

**Unit - 5: Ordinary differential equations of first order and first degree:**

- Exact differential equations.
- Equations reducible to exact form by integrating factors.

**Linear differential equation**

- Bernoulli's differential equations. Linear differential equations of higher orders with constant coefficients.
- Complementary functions
- Particular integrals.

Method of variation of parameters (second order only) Simultaneous linear differential equations with constant coefficients

## Text Books:


1. Mathematics part-I, text book for class XII, NCERT publications 2012.
2. Mathematics part-II, text book for class XII, NCERT publications 2012.
3. H.K. Dass and Rama Verma, Introduction to engineering mathematics-I S Chand Publication, 2012.
4. B.V. Ramana, Higher Engineering Mathematics. Tata McGraw-Hill Publishing Company Ltd. 2009


## Reference books


1. E.Kreyszig, Advance Engineering Mathematics. John Wiley & Sons, 2005.
2. B.S. Grewal, Higher Engineering Mathematics. Khanna Publisher, 2005.
3. Peter V. O'Neil, Advance Engineering Mathematics. Thomson (Cengage) Learning, 2007.

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### *I Year I Semester*
### BTAG -102: ENGINEERING PHYSICS-I

| Unit | Topic | Lectures |
|---|---|---|
| 1 | **Surface tension**<br>➢ Angle of contact<br>➢ Excess of pressure inside a spherical surface<br>➢ Capillary rise<br>➢ Jager's method surface tension determination<br>**Viscosity**<br>➢ Stream line motion<br>➢ Turbulent motion<br>➢ Coefficient of viscosity<br>➢ Critical velocity<br>➢ Poiseuille's equation & Viscometer | 8 |
| 2 | **Optics Interference**<br>➢ Principle of superposition<br>➢ Types of interference<br>➢ Young's experiment<br>➢ Determination of thickness of thin sheets<br>➢ Thin films testing<br>➢ Young's double slit experiment<br>➢ Coherent sources<br>**Diffraction**<br>➢ Definition of diffraction<br>➢ Types of diffraction<br>➢ Fraunhofer diffraction at single slit<br>➢ Diffraction at double slit<br>➢ Diffraction grating<br>➢ Resolving & dispersive power of grating | 10 |

| | | |
|---|---|---|
| **3** | **Polarisation**<br>➢ Polarization<br>➢ Plane of polarization<br>➢ Brewesters law<br>➢ Malus law<br>➢ Detection of circularly & elliptically polarized light<br>➢ Quarter and half wave plate<br>➢ Specific rotation and strength of sugar solution.<br>**Lasers**<br>➢ Spontaneous and stimulated emission<br>➢ Einstein A & B coefficient<br>➢ Population inversion<br>➢ He- Ne & ruby lasers. | **8** |
| **4** | **Magnetic properties of materials:-introduction**<br>➢ Para, dia & ferro magnetism<br>➢ Langevinus theory<br>➢ Hysteresis loss<br>➢ Quantum theory<br>➢ Heisenberg uncertainty principle<br>➢ Wave function<br>➢ De- boglie waves<br>➢ Schrodinger wave equation.<br>**Electronics**<br>➢ Distinction between metals<br>➢ Insulators & semiconductors Intrinsic & extrinsic semiconductor<br>➢ Determination of energy gap in semiconductors. | **10** |

# BTAG-102 ENGINEERING PHYSICS LAB

## List of Experiments

**Any ten experiments:**

(a) To find the frequency of A.C. supply using an electrical vibrator;

(b) To find the low resistance using Carey Foster bridge without calibrating the bridge wire; (c)To determine dielectric constant of material using De Sauty's bridge;

(d)To determine the value of specific charge (e/m) for electrons by helical method;

(e)To study the induced e.m.f. as a function of velocity of the magnet;

(f) To obtain hysteresis curve (B-H curve) on a C.R.O. and to determine related magnetic quantities;
To study the variation of magnetic field with distance along the axis of a current carrying circular coil and to detuning the radius of the coil;

(g) To determine the energy band gap in a semiconductor using a p-n Junction diode;

(h) To determine the slit width from Fraunhofer diffraction pattern using laser beam;

(j)To find the numerical aperture of optical fibre:

(k) To set up the fibre optic analog and digital link;

(i)To study the phase relationships in L.R. circuit; to study LCR circuit;

(j)To study the variations of thermo emf of a copper-constantan thermo-couple with temperature;

(k)To find the wave length of light by prism.

### Suggested Reading

Brijlal and Subrahmanyam. Text Book of optics. S. Chand and Co., New Delhi.
Sarkar Subir Kumar. Optical State Physics and Fiber Optics. S. Chand and Co., New Delhi. Gupta S L, Kumar V Sharma R C. Elements of Spectroscopy. Pragati Prakasam, Meeruth. Saxena B S and Gupta R C. Solid State Physics. Pragati Prakasam, Meeruth.
Srivastava B N. Essentials of Quantum Mechanics. Pragati Prakasam, Meeruth.
Vasudeva D N. Fundamentals of Magnetism and Electricity. S. Chand and Co., New Delhi

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### *I Year I Semester*
### BTAG -103 BASIC ELECTRICAL ENGINEERING

**Unit-I : D-C CIRCUIT ANALYSIS**

Circuit concept: concept of network, active and passive elements, voltage and current source , concept of linearity and linear network, unilateral and by lateral elements, R,L,C as linear element Kirchhoff's low, star delta transformation

## Unit-II: Steady state analysis of single phase AC

Ac fundamentals: sinusoidal wave form –average and effective value, form and peak factor, analysis of series ,parallel and series parallel RLC circuit ,active ,reactive and apparent power , power factor

## Unit-III: Three phase AC circuit

Three phase system –its necessity and advantages, star and delta connections, phase sequence, balance supply and balance load, line phase voltage /current relation

## Unit-IV: Magnetic circuit

Magnetic circuit concept, analogy between electric and magnetic circuits, Force acting on current carrying conductor in magnetic circuit, magnetic force due to electric current, statically and dynamically induced emf, B-H curve, Hysteresis and eddy current losses

Single Phase Transformer: Principle of operation, construction, EMF equation, Equivalent circuit, power loss Efficiency.

## Unit-V: Electrical Machines:

Concept Of electro mechanical energy conversion

DC Machines: Types, EMF equation of generator and torque equation of motor, application
Three Phase Induction Motor: Types, principle of operation, Application

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

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### BTAG -103 BASIC ELECTRICAL LAB

### LIST OF EXPERIMENTS

**Note: A minimum of ten experiments from the following should be performed**

(a)To obtain load characteristics of D.C. shunt/series /compound generator;

(b) To study characteristics of DC shunt/ series motors;

(c) To study D.C. motor starters;

(d) To perform load-test on 3 ph. induction motor & to plot torque V/S speed characteristics;

(e) To perform no-load & blocked –rotor tests on 3 ph. Induction motor to obtain equivalent ckt. Parameters & to draw circle diagram;

(f) To study the speed control of 3 ph. induction motor by cascading of two induction motors, i.e. by feeding the slip power of one motor into the other motor;

(g) To study star- delta starters physically and (a) to draw electrical connection diagram (b) to start the 3 ph. induction motor using it. (c) to reverse the direction of 3 ph. I.M.;

(h) To start a 3-phase slip –ring induction motor by inserting different levels of resistance in the rotor ckt. And to plot torque –speed characteristics;

(i) To perform no load & blocked –rotor test on 1 ph. induction motor & to determine the parameters of equivalent ckt. Drawn on the basis of double revolving field theory;

(j) To perform load –test on 1 ph. induction motor & plot torque –speed characteristics;

(k) To study power consumed in a three-phase circuit; Two lights in series controlled by one switch; Two lights in parallel controlled by one switch.

**Suggested Reading**


Thareja B L & Theraja AK. 2005. A text book of Electrical Technology. Vol. I S. Chand & Company LTD., New Delhi.

Theraja B L & Theraja AK 2005. A text book of Electrical Technology. Vol. II S.Chand & Company LTD., New Delhi.

Vincent Del Toro. 2000. Electrical Engineering Fundamentals. Prentice-Hall of India Private LTD., New Delhi.

Anwani M L. 1997. Basic Electrical Engineering. Dhanpat Rai & Co.(P) LTD. New Delhi.

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## BTAG-104 PROFESSIONAL COMMUNICATIONS

| | |
|---|---|
| **Unit-1 Fundamentals of Communications** | Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication. |
| **Unit-II Written Communication** | Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc. |
| **Unit-III Business Communication** | Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills. |
| **Unit-IV Presentation Strategies and Soft Skills.** | Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills. |
| **Unit –V Value- Based Text Readings** | Following essays from the prescribed text book with emphasis on Mechanics of writing.<br>**(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior<br>**(ii)** The Language of Literature and Science by A. Huxley<br>**(iii)** Man and Nature by J. Bronowski<br>**(iv)** Science and Survival by Barry Commoner<br>**(v)** The Mother of the Sciences by A.J. Bahm. |

**Text Book**

1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication- Principles and Practices by Meenakshi Raman &Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.

**Reference Books**

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.,Sharma& Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

## BTAG-104 PROFESSIONAL COMMUNICATION LABORATORY PRACTICAL'S

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

## LIST OF PRACTICAL'S

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

**Reference Books**

1. BansalR.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi&Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey&R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

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## BTAG-105 ELEMENTARY AGRICULTURE

**Unit 1:**

Introduction to soils ,Soil Characteristics, Nature and origin of soil, Soil forming rocks and minerals, their classification and composition, Soil forming processes, Classification of soils, Soil taxonomy orders ,Important soil physical properties; and their importance, Soil particle distribution, Soil inorganic colloids – their composition, Properties and origin of charge , Ion exchange in soil and nutrient availability;

**Unit 2:**

Soil Organic Matter-Its composition and decomposition, effect on soil fertility, Soil reaction – acid, saline and sodic soils, Quality or irrigation water, Essential plants nutrients**.** Functions and deficiency symptoms in plants, important inorganic fertilizers and their reactions in soils. Use of saline and sodic water for crop production, Gypsum requirement for reclamation of sodic soils and neutralising RSC; Liquid fertilisers and their solubility and compatibility.

**Unit 3:**

Definition and scope of agronomy ,Classification of crops, Effect of different weather parameters on crop growth and development ,Principles of tillage, tilth and its characteristics, Soil water plant relationship and water requirement of crops, Crop rotation ,Cropping systems ,Relay cropping ,Mixed cropping, Organic farming-Sustainable agriculture. Soil water plant relationship, crop coefficients, cropping scheme and pattern, water requirement of crops and critical stages for irrigation.

**Unit 4:**

Scope of horticultural and vegetable crops, Soil and climatic requirements for fruits, Soil and climatic requirements for Vegetables, Soil and climatic requirements for Floriculture crops, Improved varieties of horticulture crops, High-tech horticulture- Polyhouses for flowers and vegetables (in-brief), seed rate and seed treatment for vegetable crops; macro and micro propagation methods, plant growing structures, pruning and training, Extraction and storage of vegetables seeds. Major pests and diseases and their management in horticulture crops.

**Unit 5:**

Layout and planting methods , Nursery raising, Harvesting, Grading and packaging , Post-harvest practices , Garden tools, management of orchard , Extraction and storage of vegetables seeds. Introduction of soil mechanics, field of soil mechanics.

**Text books:** 1**.**T D Biswas, S K Mukherjee 'Soil Science' –TMH Publication

2.T. Yellamanda Reddy, G.H Sankara Reddy 'Principle of Agronomy' - Kalyani Publication

3. Jitendra Singh 'Basic Horticulture'.Kalyani Publishers

**Reference Material:** Mehta. K. K. Reclamation of Alkali Soil in India, Oxford & IBH Publication

1. Maharaj Singh. Education for Sustainable Agriculture. Indian J. Agron

# *Department of Agriculture Engineering*

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### *I Year II Semester*

### BTAG -201 ENGINEERING MATHEMATICS – II

| Unit | Topic | Lectures |
|---|---|---|
| 1 | **Matrices:**<br>➢ Definition & types matrices.<br>➢ Elementary transformations.<br>➢ Rank of a matrix.<br>➢ Reduction to normal form and triangular form.<br>➢ Inverse of a matrix.<br>➢ Consistency and solution of linear equations.<br>➢ Eigen values.<br>➢ Cayley-Hamilton theorem (without proof).<br>➢ Eigen vectors.<br>➢ Diagonalisation of matrices. | 9 |
| 2 | **Functions of Complex variable:**<br>➢ Limit continuity & differentiability.<br>➢ Analytic function & Cauchy-Riemann equations (Cartesian form).<br>➢ Harmonic function.<br>➢ Conjugate function.<br>➢ Milne Thomson method. | 9 |
| 3 | **Vector Calculus:**<br>➢ Differentiation of vectors.<br>➢ Scalar & vector point functions, vector differential operator Del.<br>➢ Gradient of a scalar function & their geometrical meaning.<br>➢ Normal & Directional derivative.<br>➢ Divergence of a vector function and their physical interpretation.<br>➢ Curl of a vector function & their physical meaning.<br>➢ Line integral.<br>➢ Surface integral.<br>➢ Volume integral- illustrative examples.<br>➢ Green's theorem (for a plane)<br>➢ Stoke's theorem- illustrative examples*.<br>➢ Gauss's theorem- illustrative examples* | 9 |

| | | |
|---|---|---|
| | **Note: In case of illustrative examples*, question are not to be set.** | |
| **4** | **Fourier series & Partial differential equation:**<br><br>➢ Periodic functions.<br>➢ Fourier series &Dirichlet's conditions.<br>➢ Fourier series of period $2\pi$ and Euler's formulae.<br>➢ Even function & odd function.<br>➢ Half range series (Period $\pi$).<br>➢ Fourier series of functions having arbitrary period (Period 2c).<br>➢ Half range, series (arbitrary period).<br>➢ Introduction & formation of partial differentiate equation.<br>➢ Linear partial differentiate equation with constant coefficient.<br>➢ Non-homogeneous linear equations. | **9** |
| **5** | **Application of partial differential equation:**<br><br>➢ Introduction & Method of separation of variables.<br>➢ One dimensional wave equation (without proof) and problems.<br>➢ One dimensional heat equation (without proof) and problems.<br>➢ Two dimensional steady state heat flow equation (without proof) & problems. | **9** |

**Text books:**


1. H.K. Dass&RajnishVerma, Higher Engg. Mathematics. S. Chand & Company Ltd., 2012
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd. 2008.


**Reference books**


1. B.S. Grewal, Higher Engineering Mathematics. Khanna Publisher, 2005.
2. E.Kreyszig, Advance Engineering Mathematics. John Wiley & Sons, 2005.
3. Peter V. O'Neil, Advance Engineering Mathematics. Thomson (Cengage) Learning, 2007

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## BTAG -202 ENGINEERING CHEMISTRY

**UNIT-I:**

Introduction to water: Temporary and permanent hardness, Zeolite process, Lime soda process Disadvantage of hard water, Scale and sludge formation in boilers, Boiler corrosion.
Chemical fuels: Classification of fuels, Calorific value, Advantage of Solid, liquid and gaseous fuel, Octane number

**UNIT 2**

Corrosion: Cause, Types, Methods of prevention-pitting and stress corrosion, Alloying, protective coating- metallic, inorganic and organic
Lubricants: Properties, Mechanism, Classification and Tests, Viscosity and Viscosity Index Flash and Fire point, Cloud and Pour Point

**UNIT 3**

Polymers: Types of polymerization, Properties, Use and methods for the determination of molecular weight of polymers.
Electro-chemistry: Specific molecular conductivity, Equivalent conductivity, Determination of conductivity, E.M.F and its measurements, Polarization, Voltage.

**UNIT 4**

Chemical Kinetics : Order and molecularity of reaction, First and second order reaction, Derivations of equation for first order and second order ,Determination of order of reaction Energy of activation ,Arrhenius equation ,Numerical of first and second order reactions.
Cement: Manufacture of Portland cement, chemistry of setting and hardening.

**Text books:**

1. Engg Chemistry by P.C Jain & Monika Jain, Publication Jain Brothers.
2. Fundamental of Biochemistry by A.C. Deb, Publication New Central Book Agency P Ltd.

**Reference Material:**

**1.** Engg Chemistry by Mani & Mishra, Publication Cengage Learning India Pvt Ltd.
**2.** Principle of Food Chemistry by John M. DeMan, an Aspen Publication.

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### *I Year II Semester*
### BTAG -203 ELEMENTS OF MECHANICAL ENGINEERING

**Unit-1**

Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static performance characteristics and elementary idea of dynamic performance characteristics of measurement devices, calibration, concept of error (systematic and random), sources of error, statistical analysis of errors.

**Unit-2**

**Engineering Materials:** Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications, Material deterioration phenomenon.

**Metals & Alloys**: Properties and Applications, Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep.

**Steels and Cast Irons:** Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel.

**Alloys of Non Ferrous Metals:** Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminium etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys.

**Unit-3**

**Ceramics:** Structure types and properties and applications of ceramics. Mechanical/Electrical behaviour and processing of Ceramics.

**Plastics:** Various types of polymers/plastics and its applications. Mechanical behaviour and processing of plastics. Future of plastics.

**Heat Treatment**: Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering (Austempering, Martempering), and various case hardening processes. Time Temperature Transformation (TTT) diagrams.

**Unit-4**

**Basic Metal Forming & Casting Processes**. Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube drawing/making and Extrusion, and their uses.

**Press-work**: Die & Punch assembly, cutting and forming, its applications. Hot-working versus cold-working

**Casting:** Pattern: Materials, types and allowances. Type and composition of Moulding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses.

**Unit -5**

Mechanical properties and Testing: Stress strain diagram, Ductile & brittle material, Stress vs. strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testing of material such as Strength tests, Hardness tests, Impact tests, Fatigue tests, Creep tests, and Non-destructive testing (NDT).

**Basic concept of thermodynamic** -System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility, Zeroth law of thermodynamics: Concept of Temperature, First law of thermodynamics: Thermodynamic definition of work, Limitations of first law of thermodynamics

## BTAG -203 BASIC ELEMENT OF MECHANICAL ENGINEERING LAB

**(a)** Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
**(b)** Study of corrosion and its effects.
**(c)** Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
**(d)** To study the Pattern making with proper allowance.
**(e)** Study the working of simple measuring instruments- Vernier callipers, micrometer, and tachometer.
**(f)** Sand testing methods (at least one, such as grain fineness number determination)
**(g)** Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.
**(h)** Creep test on creep testing machine.

## Books and References:


1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.
2. Manufacturing Technology by P.N. Rao., TMH
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson.
4. Metrology of Measurements by Bewoor and Kulkarni, TMH
5. Engineering Thermodynamics by P.K.Nag, TMH
6. Thermodynamics- An Engineering App

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## BTAG -204 FUNDAMENTALS OF COMPUTER AND PROGRAMMING

**UNIT I** Introduction to Computer System: Hardware, Software-system software, & application software; Introduction to Computing Environment; Introduction to Problem solving and notion of algorithm: Flow charting, Pseudo code, Corresponding sample C-programme, testing the code; Number Systems and their conversion: Decimal, Binary, Octal and Hexadecimal representations, bit, byte; Character representation: ASCII, sorting order; System software re-visited: machine language, symbolic language, higher level languages, what is a compiler, what is an operating system, Introduction to programme development

**UNIT II** Structure of a C-program, comments, identifiers; Fundamental Data Types: Character types, Integer, short, long, unsigned, single and double-precision floating point, complex, Boolean, constants; Basic Input/output: print f, formatting, scan f, eof errors; Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associatively,

**UNIT-III** Arrays: Array notation and represtation. Functions in C:standard function, defining a function, inter-function communication- passing arguments by value, scope rules and global variables; Top-down program development.

**UNIT-IV** Sequential search, Sorting arrays; Strings and string handling functions, Recursion; Structures: Purpose and usage of structures, declaring structures, assigning of structures. Array of structures.

### Suggested Reading


Rajaraman V. 1985. Computer Oriented Numerical Methods. Prentice Hall of India. Pvt. Ltd., New Delhi.

Balagurusamy E. 1990. Programming in 'C'. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi.

Rajaraman V. 1995. Computer Programming in 'C'. Prentice Hall of India Pvt.Ltd., New Delhi. Bronson G

and Menconi S. 1995. A First Book of 'C' Fundamentals of 'C' Programming. Jaico Publishing House, New Delhi

Sahni S.. Data Structures, Algorithms and Applications in C++. University press (India) Pvt Ltd /Orient Longman Pvt. Ltd.

Michael T. Goodrich, R. Tamassia and D Mount. Data structures and Algorithms in C++. Wiley Student Edition, John Wiley and Sons.

Mark Allen Weiss. Data Structures and Algorithm Analysis in C++. Pearson Education. Augenstein,

Langsam and Tanenbaum. Data structures using C and C++. PHI/Pearson Education.

Drozdek Adam. Data Structures and Algorithms in C++. Vikas Publishing House / Thomson International Student Edition.

Agarwal, Ajay. The Complete Reference Guide: Data Structure through C. ISBN: 8178840448; Publisher: Cyber Tech Publications.

# BTAG -204 FUNDAMENTALS OF COMPUTER PROGRAMMING LAB

1 Get familiar with OS and Environment.

2 Get familiar with C compiler

3 Implement and Test Small Routine in C

4 Data type and variable: Evaluation of Expression

5 Operators & Expression: Evaluation of Expression

6 IF, SWITCH Statements: Iteration

7 Repetition structure in C: Iteration, Function

8 Modular Programming: Recursion, Function

9 Arrays & Structures

10 Pointers: Linked Lists

11. Searching, Selection & Sorting 12 Sorting & Strings

13 Files & STD C Preprocessor

14 STD C Libraries, Use of Std. C Library

# *Department of Agriculture Engineering*

## *(Faculty of Engineering & Technology)*

## *P.K.University, Shivpuri (MP)*

### *I Year II Semester*

### BTAG -205 SURVEYING & LEVELLING

## Unit-1

Principle and basic concepts of surveying. Plans and maps. Classification of surveying. Basic measurements. Units of measurement. Types of Scales. Recording the measurement.

Principal of chain surveying. Types of Chains. Types of Ranging and Chaining. Chain and tape errors & corrections. Selection of survey station and lines. Offset measurement. Cross Staff Optical Square-Prism Square. Obstacles in chaining and ranging. Introduction to GPS survey.

## Unit-2

Methods of traversing. Prismatic compass. Surveyors compass. Angle and bearing, Quadrantal system, Local attraction, Dip of angle. Magnetic declination, plotting a traverse survey, Errors In compass survey, Bow ditch's rule, Transit rule.

## Unit-3

Plane tabling instruments and accessories, Methods and principal, Two points problem, Three points problem, Errors in plane tabling, Planimeter, Sextant, Band level, Abney level Clinometers, Pentameter, Computation of areas methods.

## Unit-4

Definition, Basic principal of levelling, Benchmark, Types of levels optical, Principal causes telescopes sensitivity of bubble tubes, Levelling staff, Temporary adjustment, Permanent adjustment of levels, Field book entries, Reduction of levels missing entries , Types of levelling, Simple and differential levelling, Check levelling & reciprocal levelling, Precise levelling, profile levelling,

## Unit-5

Theodolite traversing, Theodolite Surveying, Ranging by theodolite.Temporary & Permanent adjustment of theodolite.

## BTAG-205 SURVEYING AND LEVELLING LAB.

(1) Chain survey of an area and preparation of map.

(2) Compass survey of an area and plotting of compass survey.

(3) Plane table surveying.

(4) Levelling. L section and X sections and its plotting.

(5) Contour survey of an area and preparation of contour map.

(6) Introduction of software in drawing contour.

(7) Theodolite surveying.

(8) Ranging by Theodolite, Height of object by using Theodolite; Setting out curves by Theodolite.

(9) Minor instruments. Use of total station.

## Text books:

1- Surveying and Levelling Part-1 by T.P. Kanetkar & S.V.Kulkarni , Pune Vidyarthi Griha Prakashan

## Reference Material:

1- Surveying and Levelling By B C Punamia Vol-I & Vol-II, Laxmi Publications, 2005

2-Surveying-III Higher Surveying, B.C Punamia, Laxmi Publications 2004

# *Faculty of Engineering & Technology*
# *P.K.University*
# *Shivpuri (MP)*


**Evaluation Scheme & Syllabus for**
**Department of Agriculture Engineering**
**B.Tech. Second Year**
**(III & IV Sem)**
(Effective from session 2019-20)

**(Taken From Abdul Kalam Technical University-AKTU)**

# EVALUATION SCHEME

| | | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| **SUBJECT CODE** | **SUBJECT NAME** | **SESS.(30)** | **EXT.(70)** | **SESS.(25)** | **EXT.(25)** | |
| BTAG-301 | Mathematics-III | 30 | 70 | NA | NA | 100 |
| BTAG-302 | Fluid Mechanics & Open Channel Hydraulics | 30 | 70 | 25 | 25 | 150 |
| BTAG-303 | Soil Mechanics | 30 | 70 | 25 | 25 | 150 |
| BTAG-304 | Basic Electronics | 30 | 70 | 25 | 25 | 150 |
| BTAG-305 | Strength of Materials & Theory of Structure | 30 | 70 | 25 | 25 | 150 |
| BTAG-306 | Environment & Ecology | 30 | 70 | NA | NA | 100 |
| | | | | | | |
| | | **THEORY** | | **PRACTICAL** | | **TOTAL** |
| **SUBJECT CODE** | **SUBJECT NAME** | **SESS.(30)** | **EXT.(70)** | **SESS.(25)** | **EXT.(25)** | |
| BTAG-401 | Nano Science | 30 | 70 | NA | NA | 100 |
| BTAG-402 | Post Harvest Engg. of Cereals, Pulses & Oil Seeds | 30 | 70 | 25 | 25 | 150 |
| BTAG-403 | Watershed Hydrology, Soil & Water Conservation Engineering | 30 | 70 | 25 | 25 | 150 |
| BTAG-404 | Theory of Machines & Machine Design | 30 | 70 | NA | NA | 100 |
| BTAG-405 | Farm Machinery and Equipment-I | 30 | 70 | 25 | 25 | 150 |
| BTAG-406 | Universal Human Values & Prof. Ethics | 30 | 70 | NA | NA | 100 |
| | | | | | | |

*Department of Agriculture Engineering*
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*II Year Semester-III*

## BTAG-301: ENGINEERING MATHS–III

**UNIT I**

**Numerical Techniques – I**: Zeroes of transcendental and polynomial equations, Bisection method, Regula-falsi method, Newton-Raphson method, Rate of convergence of above methods.

**Interpolation**: Finite differences, Newton's forward and backward interpolation. Lagrange's and Newton's divided difference formula for unequal intervals**.**

**UNIT II**

**Numerical Techniques –II**: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidal method.

**Numerical differentiation & Integration**: Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

**UNIT III**

**Statistical Techniques**: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non – linear and multiple regression analysis, Binomial, Poisson and Normal distributions. Tests of significations: Chi-square test, t-test.

**UNIT IV**

**Function of Complex variable**: Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem.

**UNIT V**

**Integral Transforms**: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z-Transform and its application to solve difference equation.

**Text Books:**


1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers


**Reference Books:**


1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi.
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan & T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi

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*II Year Semester-III*

# BTAG-302: FLUID MECHANICS & OPEN CHANNEL HYDRAULICS

**UNIT I**

Properties of fluids: Ideal and real fluid. Newtonian and non Newtonian fluid, Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, Meta centre and Meta centric height, condition of floatation and stability of submerged and floating bodies.

**UNIT II**

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion; Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon.

**UNIT III**

Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, average velocity; Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient; Chezy's formula for loss of head in pipes, Flow through simple and compound pipes, Dupit equation.

**UNIT IV**

Dimensional analysis and similitude: Rayleigh's method and Buckingham's `Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery, Centrifugal pump – construction work done, heads and its efficiencies, NPSH, priming. Reciprocating pump and its working, slip and classification. Turbine- introduction, classification, pelton wheel, Francis, Kaplan turbine and its practical application.

**Suggested Reading**:


1. Khurmi, RS 1970. A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines S. Chand & Company Limited, New Delhi.
2. Modi, PM and Seth, SM 1973. Hydraulics and Fluid Mechanics. Standard Book House, Delhi.
3. Chow, VT, 1983. Open Channel Hydraulics. McGraw Hill Book Co., New Delhi.
4. Lal Jagadish, 1985. Fluid Mechanics and Hydraulics. Metropolitan Book Co. Pvt. Ltd., New Delhi.

# *Department of Agriculture Engineering*
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# *P.K. University, Shivpuri (MP)*
# *II Year Semester-III*

## BTAG-303: SOIL MECHANICS

**UNIT I**

Nature and origin of soil; Soil forming rocks and minerals their classification and composition, important physical properties of soil.

**UNIT II**

Introduction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, classification of soils, effective and neutral stress, elementary concept of Boussinesq and Wester guards analysis, new mark influence chart.

**UNIT III**

Shear strength, Mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear test, triangle test & vane shear test. Numerical exercise based on various types of tests. Compaction, composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction test field compaction method and control. Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande's method, determination of coefficient of consolidation.

**UNIT IV**

Earth pressure: plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercises. Stability of slopes: introduction to stability analysis of infinite and finite slopes friction circle method, Taylor's stability number.

**Suggested Reading**


1. Soil Mechanics, BC Punmia; Laxmi Publication (P) Ltd. New Delhi.
2. Punmia BC, Jain AK and Jain AK, 2005. Soil Mechanics and Foundations. Laxmi Publications (P) Ltd. New Delhi.
3. Ranjan Gopal and Rao ASR, 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.
4. Singh Alam, 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.
5. Sundarajan, V, 2002. Engineering Mechanics and Dynamics. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
6. Timoshenko, S and Young, DH, 2003. Engineering Mechanics. McGraw Hill Book Co., New Delhi.
7. Prasad, IB, 2004. Applied Mechanics. Khanna Publishers, New Delhi.
8. Prasad, IB, 2004. Applied Mechanics and Strength of Materials. Khanna Publishers, New Delhi.
9. Indian Society of Soil Science.1998. Fundamental of Soil Science, IARI, New Delhi.
10. Brady, Nyle C and Ray, R well, 2002. Nature and properties of soils. Pearson Education Inc; New Delhi.

# *Department of Agriculture Engineering*
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# *II Year Semester-III*
## BTAG-304: BASIC ELECTRONICS

**UNIT -I**

Semiconductors, p-n junction, V-I characteristics of p-n junction, junction breakdown, diode application-rectifier, clipper, clamper, filter.

**UNIT -II**

Bipolar junction transistor: introduction, various configuration of BJT, statics characteristics, operating point, load line analysis ,classification (A, B & C) of amplifier, various Biasing methods (fixed, self, potential divider), FET, MOSFET.

**UNIT- III**

OP- AMP, ideal OP-AMP characteristics, linear and non-linear applications of OP-AMP (adder, subtractor, integrator, comparator, differentiator), inverting and non inverting amplifier, OP-AMP voltage regulator.

**UNIT- IV**

Special diodes – Zener diode, varactor diode. LED, laser physics, semiconductor laser, PIN photodiode, avalanche photodiode, solar cell, photoconductor. Boolen algebra ,logic gate,k-map,combinational logic circuit ,half adder, full adder, Half subtractor ,full subtractor ,basic sequential circuits.

**Suggested Reading:**


1. Mehta V K. Principles of Electronics. S. Chand and Co., New Delhi.
2. Shaney A K. Measurement of Electronics and Electronic Instrumentation. Khanna Publications.
3. Roy Chowdary. Integrated Electronics. John Wiley International.
4. Kumar Anand. Digital Electronics. A. PHI.
5. Gupta Sanjeev, Sonthosh Gupta. Electronic Devices and Circuits. Danapath Rai Publications.

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*II Year Semester-III*

# BTAG-305: STRENGTH OF MATERIALS AND THEORY OF STRUCTURE

**UNIT I**
Simple stresses and strain Shear force and bending moment diagrams. Review of pure bending, Direct and shear stresses in beams due to transverse and axial loads. Analysis of statically intermediate beams. Propped beams, Fixed and continuous beams.

**UNIT II**
Slope and deflection of beams using Mcauley techniques, moment area theorems and conjugate beam method. Compound stress and strains: Principal stress and strain. Mohr's stress circle, three dimensional states of stress and strain, Torsion of circular shaft and non-circular shaft.

**UNIT III**
Columns and struts, derivation of buckling load equation for both end hinged, one end fixed and other end free, both end fixed & one end fixed and other end hinged, Empirical formula for columns.

**UNIT IV**
Loads and use of BIS Codes. Design of connections. Design of structural steel members in tension, compression and bending. Design of steel roof truss.

**UNIT V**
Design of Flanged Beams, Slabs, Columns, Foundations, Retaining walls and Silos. Analysis and design of singly and doubly reinforced sections, Shear, Bond and Torsion.

**Suggested Reading:**


1. Ramamrutham, S, 2003. Strengths of Materials. Dhanpat Rai and Sons, Nai Sarak, NewDelhi.
2. Khurmi, RS, 2001. Strength of Materials S. Chand & Co., Ltd., New Delhi.
3. Sundarajan, V, 2002. Engineering Mechanics and Dynamics. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
4. Junarkar, SB, 2001. Mechanics of Structures, Vol. I, Charotar Publishing Home, Anand.
5. Khurmi, RS, 2001. Strength of materials. S. Chand & Company Ltd., 7361, Ram Nagar, New Delhi – 110055.
6. Kumar, Shushil, 2003. Prrasure of R.C.C Design. R.K. Jain. 1705 Nai Sarsde, Delhi-110006.

*Department of Agriculture Engineering*
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*P.K. University, Shivpuri (MP)*
*II Year Semester-III*

## BTAG-306: ENVIRONMENT& ECOLOGY

**UNIT-I**

Definition, Scope & Importance, Need For Public Awareness• Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security.
Effects or human activities on environment Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment. Sustainable Development.

**UNIT-II**

Natural Resources• Water Resources· Availability and Quality aspects. Water borne diseases, Water Induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles-- Carbon, Nitrogen and Sulpher Cycles.
**Energy** - Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources – Hydro-Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio.gas. Hydrogen as an alternative future source of Energy.

**UNIT-Ill**

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management, e-waste management Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming-Effects, Urbanization, Automobile pollution. Acid Rain Ozone Layer depletion, Animal Husbandry,

**UNIT-IV**

V Environmental Protection- Role of Government, Legal aspects, initiatives by Non-Governmental organizations (NGO), Environmental Education, Women Education,

**Text Books**

l. Environmental Studies -Benny Joseph- Tata Mcgraw Hill-2005
2. Environmental Studies- Or. D.L. Manjunath, Pearson Education- 2006.
3. Environmental studies - R, Rajagopalan -Oxford Publication • 2005.
4. Text book of Environmental Science & Technology- M. Anji Reddy- US Publication .

**Reference Books**

**l**. Principles of Environmental Science and Engineering -P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering- Meenakshi, Prentice Hall India

## *Department of Agriculture Engineering*
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## *P.K. University, Shivpuri (MP)*
## *II Year Semester-III*

### BTAG-302: FLUID MECHANICS & OPEN CHANNEL HYDRAULICS LAB

1. Study of manometers and pressure gauges
2. Verification of Bernoulli's theorem
3. Determination of coefficient of discharge of venture-meter and orifice meter
4. Determination of coefficient in pipeline
5. Determination of coefficient of discharge for rectangular and triangular notch
6. Determination of coefficient of discharge for mouth piece
7. Measurement of force exerted by water jets on flat and hemispherical vanes
8. Determination of meta-centric height
9. Determination of efficiency of hydraulic ram
10. Performance evaluation of Pelton and Francis turbine
11. Study of current meter
12. Velocity distribution in open channels and determination of Manning's coefficient of rugosity.

## *Department of Agriculture Engineering*
## *(Faculty of Engineering & Technology)*
## *P.K. University, Shivpuri (MP)*
## *II Year Semester-III*

### BTAG-303: SOIL MECHANICS LAB

1. Determination of water content of soil.
2. Determination of specific gravity of soil.
3. Determination of field density of soil by core cutter method.
4. Determination of field density by sand replacement method.
5. Grain size analysis by sieving (Dry sieve analysis).
6. Grain size analysis by hydrometer method.
7. Determination of shrinkage limit.
8. Determination of permeability by constant head method.
9. Determination of permeability by variable head method.
10. Problems on composition and resolution of forces,
11. Moments of a force, couples, transmission of a couple,
12. Resolution of a force into a force & a couple; Problems relating to resultant of;
13. Co-planer force system, collinear force system, concurrent force system,
14. Co-planer concurrent force system,
15. Co-planer non-concurrent force system,
16. Non-coplaner concurrent force system,
17. Non-coplaner non-concurrent force system,
18. System of couples in space;
19. Problems relating to centroids of composite areas.

## *Department of Agriculture Engineering*
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## *P.K. University, Shivpuri (MP)*
## *II Year Semester-III*

### BTAG-304: BASIC ELECTRONICS LAB

1. To study V-I characteristics of p-n junction diode;
2. To study half wave, full wave and bridge rectifier;
3. To study transistor characteristics in CE configurations;
4. To design and study fixed and self bias transistor;
5. To design and study potential divider bias transistor;
6. To study a diode as clipper and clamper;
7. To study a OP-AMP IC 741 as inverting and no inverting amplifier;
8. To study a OP-AMP IC 741 as differentiator amplifier;
9. To study a differential amplifier using two transistors;
   To study a OP-AMP IC 741 as differential amplifier.

## *Department of Agriculture Engineering*
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## *P.K. University, Shivpuri (MP)*
## *Semester-III*

### BTAG-305: STRENGTH OF MATERIALS AND THEORY OF STRUCTURE LAB

1. To perform the tension test on metal specimen (M.S., C.I.), to observe the behaviour of materials under load, to calculate the value of E, ultimate stress, permissible stress, percentage elongation etc. and to study its fracture.
2. To perform the compression test on; Concrete cylinders &cubes, C.I., M.S. & Wood specimens and to determine various physical and mechanical properties.
3. To perform the bending tests on the specimens; M.S. Girder, Wooden beam, Plain concrete beams & R.C.C. beam, and to determine the various physical and mechanical properties.
4. To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points.
5. To study the behaviour of materials (G.I. pipes, M.S., C.I.) under torsion and to evaluate various elastic constants;
6. To study load deflection and other physical properties of closely coiled helical spring in tension and compression.
7. To perform the Rockwell, Vicker's and Brinell's Hardness tests on the given specimens.
8. To perform the Drop Hammer Test, Izod Test and Charpay's impact tests on the given specimens.
9. To determine compressive & tensile strength of cement after making cubes and briquettes.
10. Design and drawing of single reinforced beam, double reinforced beam,
11. Design and drawing of steel roof truss.
12. Design and drawing of one way, two way slabs,
13. Design and drawing of RCC building.
14. Design and drawing of Retaining wall.
15. To measure workability of cement by slump test.

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*II Year Semester-IV*

## BTAG -401: NANO SCIENCE

**UNIT I**

**Introduction**: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.

**Quantum Theory for Nano Science**: Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Potential box (Traped particle in 3D: Nanodot).

**Physics of Solid State Structures**: Size dependence of properties, crystal structures, face centered cubic nanoparticles; Tetrehedrally bounded semiconductor structures; lattice vibrations.

**Energy Bands**: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.

**Localized Particles**: Acceptors and deep taps; mobility; Excitons.

**UNIT II**

**Quantum Nanostructure**: Preparation of quantum wells, Wires and Dots, Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Single electron Tunneling, Infrared detectors; Quantum dot laser superconductivity.

**Properties of Individual Nano Particles**: Metal nano clusters; Magic numbers; Theoretical modeling of nano particles; geometric structure; electronic structure; Reactivity, Fluctuations, Magnetic clusters; Bulk to nanostructure, semiconducting nanoparticles, Optical Properties, Photo fragmentation, Coulombic Explosion. Rare Gas & Molecular clusters; Inert gas clusters; Superfluid clusters; Molecular clusters.

**UNIT III**

**Growth Techniques of Nanomaterials**: Litho and Nonlithograpahic techniques, RF Plasma, Chemical methods, Thermolysis, Pulsed laser method, Self-assembly, E-beam evaporation, Chemical Vapour Deposition, Pulsed Laser Deposition.

**UNIT IV**

**Methods of Measuring Properties**: Structure: X-ray Diffraction Technique, Particle size determination, surface structure. Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy(TEM). Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

**UNIT V**

**Carbon Nano Materials:** Bucky Ball and Carbon Nano- Tubes: Nano structures of carbon (fullerene), Fabrication, Structure. Electrical, Mechanical and Vibrational properties and applications. Nano Diamond, Boron Nitride Nano-tubes, Single Electron Transistors, Molecular Machine, Nano-Biometrics, Nano Robots.

**Text/Reference Books:**

1. CP Poole Jr, FJ Owens, “Introduction to Nanotechnology”.

# *Department of Agriculture Engineering*
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# *P.K. University, Shivpuri (MP)*
# *II Year Semester-IV*

## BTAG-402: POST HARVEST ENGG. OF CEREALS, PULSES & OIL SEEDS

**UNIT I**

Applications of unit operations and principles in cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Size reduction: principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), And Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. Material handling equipment. Types of conveyors: Belt, roller, chain and screw.

**UNIT II**

Elevators: bucket, Cranes & hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination, Psychrometric chart and its use in drying, Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations, Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sun-mechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray.

**UNIT III**

Mixing: Theory of mixing of solids and pastes, Mixing index, types of mixers for solids, liquid foods and pastes. Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. Milling of wheat, unit operations and equipment.

**UNIT IV**

Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines, Milling of corn and its products. Dry and wet milling. Milling of oilseeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran., Extrusion cooking: principle, factors affecting, single and twin screw extruders. By-products utilization.

**Suggested Reading:**


1. Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.
2. Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.
3. Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing. Vikas Publishing house Pvt. Ltd. New Delhi.
4. Geankoplis C. J. Transport processes and unit operations, Prentice Hall of India Pvt Ltd, New Delhi
5. Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.

# *Department of Agriculture Engineering*
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# *P.K. University, Shivpuri (MP)*
# *II Year Semester-IV*

## BTAG-403: WATERSHED HYDROLOGY, SOIL & WATER CONSERVATION ENGINEERING

**UNIT- I**

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-Interception, infiltration - factors influencing, measurement and indices. Evaporation - Estimation and measurement. Runoff - Factors affecting, measurement, and stage - discharge rating curve, estimation of peak runoff rate and volume, rational method, Cook's method and SCS curve number method.

**UNIT- II**

Geomorphology of watersheds – Linear, aerial and relief aspects of watersheds- stream order, drainage density and stream frequency. Hydrograph - Components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood. Flood routing – channel and reservoir routing. Drought – classification causes and impacts, drought management strategy.

**UNIT- III**

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development. Soil loss estimation – Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity - estimation by KE>25 and $EI_{30}$ methods. Soil erodibility - topography, crop management and conservation practice factors. Measurement of soil erosion - Runoff plots, soil samplers.

**UNIT- IV**

Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching. Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplussing arrangements. Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour stonewall and trenching.

**UNIT -V**

Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains. Grassed waterways and design. Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.

**Suggested Reading:**


1. Raghunath, HM, 2006. Hydrology: Principles Analysis and Design. Revised 2nd Edition, New Age International (P) Limited Publishers, New Delhi.
2. Subramanya, K. 2008. Engineering Hydrology. 3rd Edition, Tata McGraw-Hill Publishing Co., New Delhi.

   Chow, VT, D.R. Maidment and L.W. Mays. 2010. Applied Hydrology, McGraw Hill Publishing Co., New York.

3. Jaya Rami Reddy, P. 2011. A Text Book of Hydrology. University Science Press, New Delhi.
4. Linsley, R.K., MA Kohler, and JLH Paulhus. 1984. Hydrology for Engineers. McGraw-Hill Publishing Co., Japan.
5. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service, New Delhi.
7. Mal, BC 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.
8. Michael, AM and TP Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition,

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# BTAG-404: THEORY OF MACHINE AND MACHINE DESIGN

**UNIT I**

Introduction to machine and design Principle of design, Phases of design, design considerations. Elements, links, pairs, kinematics chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions. Cam, Types of cam, Terminology used in cam-follower system, Cam profile.

**UNIT II**

Types of gears. Law of gearing, velocity of sliding between two teeth in mesh. Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear, Design of spur and helical gears.
Gear train, Determination of velocity ratio and train value by using tabular method.

**UNIT III**

Types of loads and stresses, theories of failure, factor of safety, selection of allowable Stress. Stress concentration. Elementary fatigue and creep aspects. Design of Cotter joints, knuckle joint and Design of welded subjected to static loads, Design of shafts under torsion and combined bending and torsion, sleeve, and rigid flange couplings.

**UNIT IV**

Introduction to Belt drives, types of drives, belt materials, Length of belt, power transmitted, Velocity ratio, belt size for flat and V belts. Effect of centrifugal tension, Creep and Slip on power transmission, Chain drives. Design of screw motion mechanism like screw jack, lead screw. Bearing-Rolling friction, anti friction bearings. Types of governors. Constructional details and analysis of Watt, Porter, Proell governor.

**Suggested Reading:**


1. Rattan, SB, 1993. Theory of Machines. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi.
2. Khurmi R S and Gupta J K. 1994. Theory of Machines. Eurasia Publishing House Pvt. Ltd., Ram Nagar, New Delhi.
3. Bhandari V B. Machine Design Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi.

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# *II Year Semester-IV*
## BTAG-405: FARM MACHINERY AND EQUIPMENT-I

**UNIT I**

Introduction to farm mechanization. Classification of farm machines. Unit operation in crop production. Hitching systems and controls of farm machinery. Calculation of field capacity and field efficiency.

**UNIT II**

Introduction to seed-bed preparation . Familiarization with land reclamation and earth moving equipment. Machinery used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage and conservation tillage. Measurement of draft of tillage tools and calculations for power requirement for the tillage machines.Tillage machines like mould- board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery.

**UNIT III**

Introduction to sowing, planting & transplanting equipment. Working of seed drills, no-till drills, happy seeder and strip-till drills. Brief description and working of planters, bed- planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components.

**UNIT IV**

Selection of farm machinery. Calculation for economics of machinery usage comprasion of owenering with hiring of machinries and analysis of payback period of farm machinery.

**Suggested Reading:**


1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.
4. Srivastava AC. Elements of Farm Machinery.
5. Lal Radhey and AC Datta. Agricultural Engineering. through solved examples, Saroj Publication, Allahabad.

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# BTAG-406: UNIVERSHAL HUMAN VALUE & PROFE. ETHICS

**Human Values and Professional Ethics** **[L-T-P: 3-0-0]**

**Course Objectives**

This introductory course input is intended

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

**Course Methodology**

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

**Course Syllabus: Universal Human Values and Professional Ethics [L-T-P: 3-0-0]**

The whole course is divided into 5 modules.
After every two lectures of one hour each, there is a 2 hour practice session.
The teachers are oriented to the inputs through an eight to ten day workshop (Teachers' Orientation Program).
The Teacher's Manual provides them the lecture outline. The outline has also been elaborated into presentations and provided in a DVD with this book to facilitate sharing.
The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue. The process of dialogue is enriching for both, the teacher as well as the students.The syllabus for the lectures is given below:

**UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

**UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!**

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
   Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha )*- from family to world family!

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

7. Understanding the harmony in the Nature
8. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
9. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
10. Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

**UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**

11. Natural acceptance of human values
12. Definitiveness of Ethical Human Conduct
13. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
14. Competence in professional ethics:
    a) Ability to utilize the professional competence for augmenting universal human order
    b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
    c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
15. Case studies of typical holistic technologies, management models and production systems
16. Strategy for transition from the present state to Universal Human Order:
    a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    b) At the level of society: as mutually enriching institutions and organizations

**Guidelines and Content for Practice Sessions**

**UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

**PS 1:** Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

**Expected outcome:** the students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

**PS 2:** Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. – all these seem to be man-made problems threatening the survival of life on Earth – What is the root cause of these maladies & what is the way out in your opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc – what do you think, is the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

**Expected outcome:** the students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all problems and the sustained solution could emerge only through understanding of human values and value based living. Any solution brought out through fear, temptation or dogma will not be sustainable.

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**PS 3:**

1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of

i) What is Naturally Acceptable to you in relationship- Feeling of respect or disrespect?

ii) What is Naturally Acceptable to you – to nurture or to exploit others? Is your living the same as your natural acceptance or different?

2. Out of the three basic requirements for fulfillment of your aspirations- right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

**Expected outcome:**

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

**UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!**

**PS 4:** List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

**Expected outcome:** the students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the physical facility is related to the body. They are also able to see that 'I' and 'Body' are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

**PS 5:**

1. a. Observe that any physical facility you use, follows the given sequence with time : Necessary & tasteful→ unnecessary & tasteful → unnecessary & tasteless → intolerable

   b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.
3. Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

**Expected outcome:**

1. The students are able to see that all physical facilities they use are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.
2. the students are able to see that activities like understanding, desire, thought and selection are the activities of 'I' only, the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.
3. The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

**PS 6:**

1. Chalk out programs to ensure that you are responsible to your body- for the nurturing, protection and right utilisation of the body.
2. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

**Expected outcome:** The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

**UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship**

**PS 7:** Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are :

1a. Do I want to make myself happy? 2a. Do I want to make the other happy?
3a. Does the other want to make him happy?
4a. Does the other want to make me happy?

*What is the answer?*

Intention (Natural Acceptance)

1b. Am I able to make myself always happy?
2b. Am I able to make the other always happy?
3b. Is the other able to make him always happy?
4b. Is the other able to make me always happy?

*What is the answer?*

Competence

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.

**Expected outcome:** The students are able to see that the first four questions are related to our Natural Acceptance i.e. Intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a bad person.

**PS 8:**

1. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under- evaluation, over-evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

**Expected outcome:** The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms, and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

**PS 9:**

1. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group.
2. Develop three chapters to introduce 'social science- its need, scope and content' in the primary education of children

**Expected outcome:** The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

**Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

**PS 10:** List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.

**Expected outcome:** The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participation(in terms of nurturing, protection and right utilization) in the nature.

**PS 11:**

1. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
2. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

**Expected outcome:** The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

**UNIT 5: Implications of the above Holistic Understanding of Harmony at all Levels of Existence**

**PS 12:** Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

**Expected outcome:** The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

**PS 13:**

1. Suggest ways in which you can use your knowledge of Technology/Engineering/ Management for universal human order, from your family to the world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected outcome:** The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems.

**PS 14:** The course is going to be over now. Evaluate your state before and after the course in terms of

a. Thought b. Behavior and c. Work d. Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected outcome:** The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society.

**Reference Material**

The primary resource material for teaching this course consists of

a. The text book

R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

b. The teacher's manual

R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

c. A set of DVDs containing

- Video of Teachers' Orientation Program
- PPTs of Lectures and Practice Sessions
- Audio-visual material for use in the practice sessions

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:


1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity,* The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.


**Relevant websites, movies and documentaries**

1. Value Education websites, http://uhv.ac.in, *http://www.uptu.ac.in*
2. Story of Stuff, *http://www.storyofstuff.com*
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*
6. *Gandhi A., Right Here Right Now, Cyclewala Productions*

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## BTAG-402: POST HARVEST ENGG. OF CEREALS, PULSES & OIL SEEDS LAB

1. Performance evaluation of different types of cleaners and separators.
2. Determination of separation efficiency,
3. Study of different size reduction machines and performance evaluation,
4. Determination of fineness modulus and uniformity index, Study of different types of conveying and elevating equipments.
5. Study of different types of mixers.
6. Measurement of moisture content: dry basis and wet basis,
7. Study on drying characteristics of grains and determination of drying constant,
8. Determination of EMC (Static and dynamic method),
9. Study of various types of dryers,
10. Study of different equipments in rice mills and their performance evaluation,
11. Study of different equipments in pulse mills and their performance evaluation,
12. Study of different equipments in oil mills and their performance evaluation,
13. Type of process flow charts with examples relating to processing of cereals pulses and oil seeds,
14. Visit to grain processing industries.

## BTAG-403: WATERSHED HYDROLOGY, SOIL & WATER CONSERVATION ENGINEERING LAB

1. Visit to meteorological observatory and study of different instruments.
2. Design of rain gauge network. Exercise on intensity - frequency - duration curves.
3. Exercise on intensity-frequency-duration curves
4. Exercise on depth - area - duration and double mass curves.
5. Analysis of rainfall data and estimation of mean rainfall by different methods.
6. Exercise on frequency analysis of hydrologic data and estimation of missing data, test for consistency of rainfall records.
7. Exercise on computation of infiltration indices.
8. Computation of peak runoff and runoff volume by Cook's method and rational formula.
9. Study of different types and forms of water erosion.
10. Exercises on computation of rainfall erosivity index.
11. Computation of soil erodibility index in soil loss estimation.
12. Determination of length of slope (LS) and cropping practice (CP) factors for soil loss estimation by USLE and MUSLE.
13. Exercises on soil loss estimation/measuring techniques.
14. Study of rainfall simulator for erosion assessment.

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## BTAG-405: FARM MACHINERY AND EQUIPMENT-I LAB

1. Familiarization with different farm implements and tools.
2. Study of hitching systems, Problems on machinery management.
3. Study of primary and secondary tillage machinery – construction, operation, adjustments and calculations of power and draft requirements.
4. Study of sowing and planting equipment – construction, types, calculation for calibration and adjustments.
5. Study of transplanters – paddy, vegetable, etc.
6. Identification of materials of construction in agricultural machinery and study of material properties.
7. Study of heat treatment processes subjected to critical components of agricultural machinery.

# *Faculty of Engineering & Technology*
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# *Shivpuri (MP)*

**Evaluation Scheme & Syllabus for**
**Department of Agriculture Engineering**
**B.Tech. Third Year**
**(V & VI Sem)**

**(Effective from session 2019-20)**

**(Taken From Abdul Kalam Technical University-AKTU)**

# SEMESTER-V

| SUBJECT CODE | SUBJECT NAME | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| | | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG-501 | Managerial Economics | 30 | 70 | NA | NA | 100 |
| BTAG-502 | Irrigation & Drainage Engg | 30 | 70 | 25 | 25 | 150 |
| BTAG-503 | Sociology | 30 | 70 | NA | NA | 100 |
| BTAG-504 | Farm Machinery and Equipment-II | 30 | 70 | 25 | 25 | 150 |
| BTAG-505 | Thermodynamics, Refrigeration and Air Conditioning | 30 | 70 | 25 | 25 | 150 |
| BTAG-506 | Seed Processing | 30 | 70 | NA | NA | 100 |
| | Tractor & Farm M/C Operation & maintenance Lab | NA | NA | 25 | 25 | 50 |

# SEMESTER-VI

| SUBJECT CODE | SUBJECT NAME | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| | | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG-601 | Industrial Management | 30 | 70 | NA | NA | 100 |
| BTAG-602 | Tractor & Auto Motive Engine | 30 | 70 | 25 | 25 | 150 |
| BTAG-603 | EPAP, Post-Harvest Engg of horticultural, Medicinal and Aromatic Plants | 30 | 70 | 25 | 25 | 150 |
| BTAG-604 | Water Harvesting and Soil Conservation Structures | 30 | 70 | 25 | 25 | 150 |
| BTAG-605 | Field operation and maintenance of tractor and farm Machinery | 30 | 70 | NA | NA | 100 |
| BTAG-606 | Cyber Security | 30 | 70 | NA | NA | 100 |

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## BTAG -501: MANAGERIAL ECONOMICS L-T-P: 3-0-0

**Unit I: Introduction of Engineering Economics and Demand Analysis**: Meaning and nature of eonomics, Relation between science, engineering, technology and economics; Meaning of demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of demand &Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and Importance of elasticity.

**Unit II: Concept of Supply**: Law of Supply, Factors affecting Supply, Elasticity of supply.
**Demand Forecasting**: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;

**Unit III: Cost Analysis**- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.

**Unit IV: Market Structure**: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

**Unit V:** Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

**References:**

1. Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, “Principles of Microeconomics”, Oxford University Press.
3. Koutsoyiannis A, “Modern Microeconomic”, Macmillan Education Ltd.
4. Dwivedi DN, “Principles of Microeconomics”, Pearson Education.
5. Cowell, FA, “Microeconomic Principles and Analysis”, Oxford University Press.

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# *III Year Semester-V*

## BTAG-502: IRRIGATION & DRAINAGE ENGG.

**Unit-1**

Major and medium irrigation schemes of India, purpose of irrigation, environmental impact of irrigation projects, source of irrigation water, present status of development and utilization of different water resources of the country; measurement of irrigation water: weir, flumes and orifices and other methods.

**Unit-2**

Open channel water conveyance system: design and lining of irrigation field channels, on farm structures for water conveyance, control & distribution; underground pipe conveyance system: components and design.

**Unit-3**

Land grading: criteria for land levelling, land levelling design methods, estimation of earth work; soil water plant relationship: soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants, measurement of soil moisture, moisture stress and plant response.

**Unit-4**

Water requirement of crops: concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies; surface methods of water application: border, check basin and furrow irrigation- adaptability, specification and design considerations.

**Unit-5**

Sub-surface drainage purpose and benefits, investigations of design parameters, hydraulic conductivity, drainable porosity, water table etc., types of use of subsurface drainage system, steady and unsteady state methods for drain depth and spacing, installation and cost estimation, drainage of salt affected soils and leaching requirement inter-relation of irrigation and drainage, canal command area, development programmes. Adaptability, merit, demerit and design consideration of Drip and sprinkeler Irrigation method.

**Text Books:**

1.Michael A.M. 2012. Irrigation: Theory and Practice. Vikas Publishing House New 2.Delhi. Majumdar D. K. 2013. Irrigation Water Management Principles. PHI learning Private Limited New Delhi 2nd Edition.

3. Allen R. G., L. S. Pereira, D. Raes, M. Smith. 1998. Crop Evapotranspiration guidelines for computing crop water requirement. Irrigation and drainage Paper 56, FAO of United Nations, Rome.

4. Murthy VVN. 2013. Land and Water Management Engineering. Kalyani Publishers, New Delhi.

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*III Year Semester-V*

## BTAG -503: SOCIOLOGY

**L-T-P: 3-0-0**

**Unit I** Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.

**Unit II** Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

**Unit III** Industrialization in India. Industrial Policy Resolutions – 1956. Science. Technology and Innovation Policy of India 2013.

**Unit IV** Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals.

**Unit V** Visualizing the future: Models of industrialization- Collectivist, anarchist, free market, environmentalist, etc. Cultural issues, consumer society and sociological concerns.

**References:**


1. PREMVIR KAPOOOR, Sociology & Economics for Engineers, Khanna Publishing House (Edition 2018).
2. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill, New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Ed., McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co.,
5. S.C. SHARMA, Industrial Safety and Health Management, Khanna Book Publishing Co. (P) Ltd., Delhi
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker, Rawat, Jaipur,1998.
6. BHOWMICK SHARIT, Industry, Labour and Society,Orient, 2012.
7. RICHARD BROWN, JOHN CHILD, AND S R PARKER, The Sociology of Industry 1st Edition, Routledge, 2015.

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*III Year Semester-V*

## BTAG-504 FARM MACHINERY AND EQUIPMENT-II

**Unit-1**

Introduction to plant protection equipment – sprayers and dusters. Classification of sprayers and sprays. Types of nozzles. Calculations for calibration of sprayers and chemical application rates. Introduction to interculture equipment. Use of weeders – manual and powered. Study of functional requirements of weeders and main components.

**Unit-2**

Familiarization of fertilizer application equipment. Study of harvesting operation – harvesting methods, harvesting terminology. Study of mowers – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern.

**Unit-3**

Study of reapers, binders and windrowers – principle of operation and constructional details. Importance of hay conditioning, methods of hay conditioning, and calculation of moisture content of hay. Introduction to threshing systems – manual and mechanical systems. Types of threshing drums and their applications. Types of threshers- tangential and axial, their constructional details and cleaning systems. Study of factors affecting thresher performance.

**Unit-4**

Study of grain combines, combine terminology, classification of grain combines, study of material flow in combines. Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations. Study of straw combines – working principle and constructional details. Study of root crop diggers – principle of operation, blade adjustment and approach angle, and calculation of material handled.

**Unit-5**

Study of potato and groundnut diggers. Study of Cotton harvesting – Cotton harvesting mechanisms, study of cotton pickers and strippers, functional components. Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools.

## Text Books :

1.Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.

2. Smith HP and LH Wilkey. Farm Machinery and Equipment.

3. Culpin Claude. Farm Machinery.

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*III Year Semester-V*

# BTAG-505: THERMODYNAMIC, REFRIGERATION AND AIR CONDITIONING

**UNIT-I**

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow process. Carnot cycle, Carnot theorem.

**UNIT-II**

Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process. Otto, diesel and dual cycles. Principles of refrigeration, - units, terminology, and air refrigerators working on reverse Carnot cycle and Bell Coleman cycle, open air refrigeration cycle, merit demerit of air refrigeration.Vapour refrigeration-mechanism, P-V, P-S,P-H diagrams, vapour compression cycles, dry and wet compression, super cooling and sub cooling.

**Unit-III**

Vapour absorption refrigeration system. Common refrigerants and their properties. Design calculations for refrigeration system. Cold storage plants.Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process. Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods.

**UNIT-IV**

Fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications, Food preservation, Domestic refrigerators ,commercial refrigerators, method of Food freezing. Study of cold storage for fruits and vegitable, freezing load and time calculations for food materials,study of window air conditionors repair and maintenace of referigeration and air condioning systems and chilling or ice making and cold storage plants.

**Text Books :**


1. Kothandaraman, CP, Khajunia; P.R and Arora, SC, 1992. A couse in thermodynamics and heat engines. Dhanpat Rai and sons 1982 Nai Sarak New Delhi.
2. Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.
3. Mathur M L and Mehta F S. 1992. Thermodynamics and Heat PowerEngineering.DhanpatRai and Sons 1682 Nai Sarak, New Delhi.
4. Nag P K. 1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., New Delhi.

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## BTAG 506: SEED PROCESSING LTP(3-1-0)

**Unit-1**

Seed processing and its importance, principles of seed processing, seed industry and seed acts; Development of seed industry in India, Preparing seed for processing; Seed conditioning machines. Debearder machines, Hand and power operated shelling machines; Seed cleaning, grading and separating machines& their design.

**UNIT- II**

Seed drying, natural and mechanical, dryers for seeds. Types & operation and maintenance of seed dryers; Seed cleaning; different type of air-screen cleaning/ separating machines, Seed grading; different types of seed graders such as length and breadth separators, disc separators, Indented cylinder separator, gravity separator; De-stoner; Air classifier Magnetic separators, colour separators and operation, care & maintenance of cleaners and graders.

**UNIT- III**

Seed treatment; types of treatment, methods and related equipments such as liquid treaters, slurry treaters, dust and fumigants, precautions regarding the seed treatment and ISI recommendations; Seed packaging, stitching and bag closing machines, automatic weighing machines and tagging etc.

**UNIT- IV**

Seed storage; principles of seed storage, storage structures; Dehumidifiers to control temp, RH and moisture, changes in seed quality during storage. CAP storage of hermetically sealed storages; Grain bins and silos, drying-cum-storage bins and their design.

**UNIT- V**

Seed conveyors; bucket elevators, belt conveyors, screw conveyors, trucks Wagons; Repair and maintenance of different types of conveying devices; Seed plant layout design and construction.

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## BTAG - IRRIGATION & DRAINAGE ENGG. LAB.

1. Measurement of soil moisture by different soil moisture measuring instruments
2. Measurement of infiltration rate, computation of evaporation and transpiration.
3. Design of underground pipe line system.
4. Measurement of advance and recession in border irrigation and estimation of irrigation efficiency.
5. Measurement of uniformity coefficient of sprinkler irrigation method.
6. Measurement of uniformity coefficient of drip irrigation method.
7. In-situ measurement of hydraulic conductivity.
8. Determination of drainage coefficients.
9. Installation of piezometer and observation well.
10. Preparation of iso-bath and isobar maps.
11. Measurement of hydraulic conductivity and drainable porosity.
12. Design of surface drainage systems and subsurface drainage systems.
13. Determination of chemical properties of soil and water.
14. Fabrication of drainage tiles and testing of drainage tiles.
15. Determination of gypsum requirement for land reclamation;
16. Installation of sub-surface drainage system;
17. Cost analysis of surface and sub-surface drainage system.

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*III Year Semester-V*

## BTAG- FARM MACHINERY AND EQUIPMENT-II LAB

(1) Familiarization with plant protection and interculture equipment.

(2) Study of sprayers, types, functional components.

(3) Study of dusters, types and functional components.

(4) Calculations for chemical application rates.

(5) Study of nozzle types and spread pattern using patternator with referance to BIS code.

(6) Familiarization with manual and powered weeding equipment and identification of functional components.

(7) Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters.

(8) Study of various types of mowers, reaper, reaper binder. (9)Study of functional components of mowers and reapers.

(10)Familiarization with threshing systems, cleaning systems in threshers.

(11)Calculations of losses in threshers with referance to BIS code.

(12)Familiarization with functional units of Grain combines and their types.

(13)Calculations for grain losses in a combine.

(14) Study of root crop diggers and familiarization with the functional units and attachments. Familiarization with the working of cotton and maize harvesters.

(15) Familiarization with vegetable and fruit harvesters.

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*Semester-V*

## BTAG-THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING LAB

1. Study of vapour compression and vapour absorption systems
2. Solving problems on refrigeration on vapour absorption system
3. Experiments with the refrigeration tutor to study various components of refrigeration
4. Determination of the coefficient of performance of the refrigeration tutor
5. Experiment on humidifier for the determination of humidifying efficiency
6. Experiment on dehumidifier for the determination of dehumidifying efficiency
7. Experiment on the cooling efficiency of a domestic refrigerator
8. Experiments on working details of a cold storage plant and air conditioning unit
9. Experiments with air conditioning tutor to study various components
10. Determination of the coefficient of performance of air condititiong tutor.

## BTAG-507 TRACTOR& FARM MACHINERY OPERATION AND MAINTENANCE LAB

(1) Familiarization with different makes and models of Agricultural tractors.

(2) Identification of functional systems including fuel systems, cooling system, transmission system, steering hydrolic system.

(3) Practice of operating of trillage tools(Mould board plough/disc plough) and their adjustment in the field.

(4) Study of field patterns while operating a tillage implement. Hitching and de- hitching of mounted and trail type implement of the tractor.

(5) Care and maintenance produce of Agricultural machinery during operation and off season.

(6) Repaire and maintenance of implements -adjustment of functional parameters in tillage implements.

(7) Replacement of furrow openers and change of blades of rotabators.

(8) Maintenance of cutter bar in a reaper.

(9) Adjustments in a thresher for different crops.

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## BTAG – 601: INDUSTRIAL MANAGEMENT

**L-T-P: 3-0-0**

**I** **Introduction:** Concept and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

**II** **Functions of Management,** Taylor's Scientific Management Theory, Fayol's Principles of Management, Social responsibilities of Management,
Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

**III** **Work Study:** Introduction, definition, objectives, steps in work study, Method study: definition, objectives, steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control
Inventory Control: Inventory, Cost, Models of inventory control: EOQ, ABC, VED

**IV** **Quality Control**: statistical quality control, Control charts for variables and attributes, Acceptance Sampling- Single sampling- Double sampling plans, Introduction to TQM.

**V** **Project Management**: Project network analysis, CPM, PERT and Project crashing and resource Leveling

**References:**


1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R. Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072)
2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Management I RaviShankar/ Galgotia.

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*III Year Semester-VI*

# BTAG-602: TRACTOR & AUTO MOTIVE ENGINE

**Unit-I** **SEM- VI**

Study of sources of farm power –conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies.

**Unit-II**

Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment.

**Unit-III**

Study of Cam profile, valve lift and valve opening area. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines.

**Unit-IV**

Study of detonation and knocking in IC engines. Study of carburetion system, carburettors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle. Engine governing – need of governors, governor types and governor characteristics.

**Unit-V**

Study of lubrication system – need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing with referance to BIS code**.**

**Text Books :**


1. Tractors and their Power Units,John B. Lijiedahal, Paul K. Turnquist :CBS Publication
2. Farm Tractor maintenance and repair, S.C.Jain; Standard Publishers Distributors.
3. Frazeee, Irving and Philip, V.E. Tractors and Crawlers.
4. V. Ganeshan , IC engine

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# *III Year Semester-VI*

## BTAG-603: EPAP, POST HARVEST ENGG. OF HORTICULTURAL, MEDICINAL AND AROMATIC PLANTS

**Unit-I**

Classification and importance of engineering properties of Agricultural Produce, shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, and vegetables, Thermal properties, Heat capacity, Specific heat, Thermal conductivity, Thermal diffusivity, Heat of respiration; Co-efficient of thermal expansion, Friction in agricultural materials; Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity.

**Unit-II**

Rheological properties; force, deformation, stress, strain, elastic, plastic and viscous behaviour, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non- Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Electrical properties; dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination. Application of engineering properties in handling processing machines and storage structure.

**Unit-III**

Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing, Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc.

**Unit-IV**

Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture), Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing.

**Unit-V**

History, scope, opportunities and constraints in the cultivation and utilization of medicinal And aromatic plants in India. Importance, origin, distribution, area, production, climatic and Soil requirements, Propagation and nursery techniques, planting and aftercare, training and pruning, nutritional and water requirements. Harvesting, processing and economics of under mentioned important medicinal and aromatic plants. Medicinal Plants: pepper, cardamom, clove, ginger, turmeric, betelvine, periwinkle,

**TEXT BOOKS:**

1.Arthey, D. and Ashurst, P. R. 1966. Fruit Processing. Chapman and Hall, New York.

2.Pantastico, E.C.B. 1975. Post-harvest physiology, handling and utilization of tropical and subtropical fruits and vegetables AVI Pub. Co., New Delhi.

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*III Year Semester-VI*

# BTAG-604: WATER HARVESTING AND SOIL CONSERVATION STRUCTURES

**Unit-I**

Water harvesting -principles, importance and issues. Water harvesting techniques - classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques - terracing and bunding, rock and ground catchments.

**Unit-II**

Long-term harvesting techniques - purpose and design criteria. Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes. Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction.

**Unit-III**

Percolation pond - site selection, design and construction details. Design considerations of nala bunds. Soil erosion control structures - introduction, classification and functional requirements. Permanent structures for soil conservation and gully control - check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures - hydrologic, hydraulic and structural design and stability analysis.

**Unit-IV**

Hydraulic jump and its application. Drop spillway - applicability, types - straight drop, box- type inlet spillways - description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

**TEXT BOOKS:**

1.Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

2.Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.

3.Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.

4. OP Gupta, Element of Land/Soil Pollution, Khana Publishing House.

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# BTAG-605: FIELD OPERATION AND MAINTENANCE OF TRACTOR AND FARM MACHINERY

**Unit-I**

Familiarization with different makes and models of agricultural tractors. Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems. Study of maintenance points to be checked before starting a tractor.

**Unit-II**

Familiarization with controls on a tractor. Safety rules and precautions to be observed while driving a tractor. Driving practice of tractor. Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field. Study of field patterns while operating a tillage implement.

**Unit-III**

Hitching & De-hitching of mounted and trail type implement to the tractor. Driving practice with a trail type trolley – forward and in reverse direction. Introduction to tractor maintenance – precautionary and break-down maintenance. Tractor starting with low battery charge. Introduction to trouble shooting in tractors.

**Unit-IV**

Familiarization with tools for general and special maintenance. Introduction to scheduled maintenance after 10, 100, 300, 600, 900 and 1200 hours of operation. Safety hints. Top end overhauling. Fuel saving tips. Preparing the tractor for storage. Care and maintenance procedure of agricultural machinery during operation and off-season. Repair and maintenance of implements – adjustment of functional parameters in tillage implements.

**Unit-V**

Replacement of broken components in tillage implements. Replacement of furrow openers and change of blades of rotavators. Maintenance of cutter bar in a reaper. Adjustments in a thresher for different crops. Replacement of V-belts on implements. Setting of agricultural machinery workshop.

**Suggested Reading**


1. Ghosh RK and S Swan. Practical Agricultural Engineering. Black PO and WE Scahill. Diesel Engine Manual.
2. Southorn N. Tractor operation and maintenance.
3. Jain SC and CR Rai. Farm Tractor Maintenance and Repair. Operators' manuals of tractors. Service manuals provided by manufacturers.

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## III YEAR VI SEMESTER
## BTAG-606 CYBER SECURITY

**Unit: I**

Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

**Unit-II**

**Application Security**: (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Public Key Cryptography

**Unit-III**

Developing Secure Information Systems- Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.

**Unit- IV**

Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Evolving Technology Security – Mobile, Cloud, Outsourcing, SCM.

**Unit-V**

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law. Case Study – Corporate Security

**References:**


1. Charles P. Pfleeger, Shari Lawerance Pfleeger, “Analysing Computer Security”, Pearson Education India.
2. V.K.Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
3. Sarika Gupta & Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House
4. Anshul Kaushik, Cyber Security, Khanna Publishing House
5. Dr.Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla ,”Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
6. Michael E.Whitman and Herbert J Mattord "Principle of Information Security" Cengage
7. Mike Chapple and David Seidl "Cyberwarfare: Information operations in a connected world" Jones & Bartlett Learning
8. Schou, Shoemaker, “Information Assurance for the Enterprise”, Tata McGraw Hill.
9. CHANDER, HARISH,” Cyber Laws And It Protection ” , PHI Learning Private Limited ,Delhi
10. V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi

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### BTAG- POST-HARVEST ENGG. OF HORTICULTURAL, MEDICINAL AND AROMATIC PLANTS LAB

(1) Performance evaluation of peeler and slicer.

(2) Performance evaluation of juicer and pulper.

(3) Performance evaluation of blanching equipment,

(4) Testing adequacy of blanching, Study of cold storage and its design,

(5) Study of CAP and MAP storage, Minimal processing of vegetables.

(6) Preparation of value added products.

(7) Visit to fruit and vegetable processing industry, Visit to spice processing plant.

(8) Study of charcteristics of differant medicinal and aeromatic plant & Identification of their economic part.

(9) Harvesting drying, grading,storage and packaging of medicinal and aeromatic plant.

(10) Study on preparation of plant materials for extraction and value added products from medicinal and aeromatic plants.


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### BTAG-653 WATER HARVESTING AND SOIL CONSERVATION LAB

(1) Study of different types of farm ponds.

(2) Computation of storage capacity of embankment type of farm ponds.

(3) Design of dugout farm ponds. Design of percolation pond and nala bunds.

(4) Runoff measurement using H-flume.

(5) Exercise on hydraulic jump. Exercise on energy dissipation in water flow.

(6) Hydrologic, hydraulic and structural design of drop spillway and stability analysis.

(7) Design of SAF stilling basins in chute spillway.

(8) Hydrologic, hydraulic and structural design of drop inlet spillway.

(9) Design of small earthen embankment structures.

(10) Practice on softwares for design of soil and water conservation structures.

(11) Field visit to watershed project areas treated with soil and water conservation measures / structures.

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*III Year Semester-VI*

## BTAG - ENGINEERING PROPERTIES OF AGRICULTURAL PRODUCE LAB

(1) Determination of the shape and size of grains, fruits and vegetables.

(2) Determination of bulk density and angle of repose of grains,

(3) Determination of the particle density/true density and porosity of solid grains.

(4) Finding the co-efficient of external and internal friction of different crops.

(5) Finding out the terminal velocity of grain sample and study the separating behavior in a vertical wind tunnel.

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**Evaluation Scheme & Syllabus**
**Department of Agriculture Engineering**
**B.Tech. Fourth Year**
**(VII & VIII Sem)**

**(Effective from session 2019-20)**

**(Taken From Abdul Kalam Technical University-AKTU)**

## Semester - VII

| | | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| SUBJECT CODE | SUBJECT NAME | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG-701 | Food Quality & Control | 30 | 70 | NA | NA | 100 |
| BTAG-702 | Design of Agricultural Machinery | 30 | 70 | NA | NA | 100 |
| BTAG-703 | Soil & Water Conservation Structure | 30 | 70 | 25 | 25 | 150 |
| BTAG-704 | Drying & Storage Engg. | 30 | 70 | NA | NA | 100 |
| BTAG-705 | Ground Water & Well Pump Engg. | 30 | 70 | NA | NA | 100 |
| | Mini project | NA | NA | 25 | 25 | 50 |
| | Industrial training | NA | NA | 25 | 25 | 50 |

## Semester - VIII

| | | THEORY | | PRACTICAL | | TOTAL |
|---|---|---|---|---|---|---|
| SUBJECT CODE | SUBJECT NAME | SESS.(30) | EXT.(70) | SESS.(25) | EXT.(25) | |
| BTAG-801 | Precision Farming Techniques for Protected Cultivation | 30 | 70 | NA | NA | 100 |
| BTAG-802 | Mechanics of Tillage & Traction | 30 | 70 | NA | NA | 100 |
| BTAG-803 | Agricultural Structure & Environmental Control | 30 | 70 | NA | NA | 100 |
| BTAG-804 | Crop process Engg | 30 | 70 | NA | NA | 100 |
| | Project | NA | NA | 25 | 25 | 50 |
| | Seminar | NA | NA | 25 | 25 | 50 |

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# *IV Year Semester-VII*

## BTAG-701: FOOD QUALITY& CONTROL

**Unit-I**

Basics of Food Science and Food Analysis, Concept, objectives and need of food quality. Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition. Sampling; purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials.

**Unit-II**

Quality control, Quality control tools, Statistical quality control, Sensory evaluation methods, panel selection methods, Interpretation of sensory results. Instrumental method for testing quality. Food adulteration and food safety. TQM and TQC, consumer preferences and acceptance.

**Unit-III**

Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP (Hazard analysis and critical control point), Sanitation in food industry (SSOP), Food Laws and Regulations in India, FSSAI, Food grades and standards BIS, AGMARK, PFA, FPO, ISO 9000, 22000 Series. CAC (Codex Alimantarious Commission),Traceability and Quality Assurance system in a process plant, Bio safety and Bioterrorism

**Suggested Reading**

1.Ranganna S. Hand book of Analysis and Quality Control for Fruit and Vegetable Products.

Srilakshmi B, Food Science.

2.Sharma Avanthi. A text book of Food Science and Technology.

3.Mudambi Sumati R, Rao Shalini M and Rajagopal M.V. Food Science. Potter NN and Hotchkiss JH, Food Science.

4. Dev Raj, Rakesh Sharma and Joshi V.K, Quality for Value Addition in Food Processing.

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## BTAG-702: DESIGN OF AGRICULTURE MACHINERY

**Unit-I**

Materials of construction of agricultural farm machinery and tractor - their composition and properties.

**Unit-II**

Force analysis of primary tillage tools and their hitching systems, design of tillage implements- M B plough, disk plough, disk harrow, rotavator

**Unit-III**

Design of seed-drill, happy seed-drill, seed metering device, power transmission and furrow opener such as double disc, Inverted T type and roto type(rotavater).

**Unit-IV**

Design of planter such as maize, cotton, sugar cane planter, vegetable planter.

**Unit-V**

Design considerations of threshing machines, combines.

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# BTAG-703: SOIL AND WATER CONSERVATION STRUCTURES

**UNIT- I**

Introduction; classification of structures, functional requirements of soil erosion control structures; flow in open channels-types of flow, state of flow, regimes of flow, energy and momentum principles, specific energy and specific force; hydraulic jump and its application, type of hydraulic jump, energy dissipation due to jump, jump efficiency, relative loss of Energy;

**UNIT- II**

Runoff measuring structures-parshall flume, H - flume and weirs; straight drop spillway - general description, functional use, advantages and disadvantages, structural parts and functions; components of spillway, hydrologic and hydraulic design, free board and wave free board, aeration of weirs, concept of free and submerged flow.

**UNIT- III**

Structural design of a drop spillway-loads on headwall, variables affecting equivalent fluid pressure, determination of saturation line for different flow conditions, seepage under the structure, equivalent fluid pressure of triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension;

**UNIT- IV**

Chute spillway general description and its components, hydraulic design, energy dissipaters, design criteria of a SAF stilling basin and its limitations,

**UNIT- V**

Drop inlet spillway- general description, functional use, design criteria; design of diversions; small earth embankments-their types and design principles, farm ponds and reservoirs, cost estimation of structures.

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# BTAG-704: DRYING & STORAGE ENGINEERING

**UNIT- I**

Moisture content and methods for determination, importance of EMC and methods of its determination, EMC curve and EMC model, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, drying models.

**UNIT- II**

Calculation of drying air temperature and air flow rate, air pressure within the grain bed, Shred's and Hukill's curve, different methods of drying including puff drying, foam mat drying, freeze drying, etc. Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products.

**UNIT- III**

Types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidities inside storage, calculation of refrigeration load; modified atmospheric storage and control of its Environment, air movement inside the storage,

**UNIT- IV**

Storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai,Kothar, silo, CAP, warehouse - design and control of environment.

**UNIT- V**

Storage of cereal grains and their products, storage of seeds, hermetically sealed and air cooled storages-refrigerated, controlled atmosphere, modified atmospheric and frozen storages. Storage condition for various fruits and vegetables under cold and CAP storage system. Economic, aspects of storage.

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## BTAG-705: GROUNDWATER, WELLS AND PUMPS ENGG.

**Unit -I**

Occurrence and movement of ground water, aquifer and its types, classification of wells, familiarization of various types of bore wells, design of open well, groundwater exploration techniques, methods of drilling of wells.

**Unit- II**

Design of assembly and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's etc.

Well interference, multiple well systems, surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial groundwater recharge planning, modeling, ground water project formulation.

**Unit -III**

Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, parts of centrifugal pumps; pump selection, installation and troubleshooting; design of centrifugal pumps,

**Unit -IV**

Performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics.

**Unit- V**

Priming, self priming devices, roto-dynamic pumps for special purposes such as deep well turbine pump and submersible pump.

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## BTAG-703: SOIL AND WATER CONSERVATION STRUCTURES LAB

1. Study of soil loss measurement techniques.
2. Study of details of Coshocton wheel and multi-slot runoff samplers.
3. Determination of sediment concentration through oven dry method.
4. Problems on Universal Soil Loss Equation.
5. Preparation of contour map of an area and its analysis.
6. Design of vegetative waterways; Design of contour bunding system.
7. Design of graded bunding system.
8. Design of various types of bench terracing systems.
9. Determination of rate of sedimentation and storage loss in reservoir.
10. Design of Shelter belts and wind breaks.

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# BTAG-801: PRECISION FARMING TECHNIQUES FOR PROTECTED CULTIVATION

**Unit-I**

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment.

**Unit-II**

Design and construction of green houses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment.

**Unit-III**

Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc.Greenhouse heating – necessity, components, methods, design of heating system. Root media –types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation.

**Unit-IV**

Irrigation in greenhouse and net house – Water quality, types of irrigation system, components,design, installation and material requirement. Fogging system for greenhouses and net houses –introduction, benefits, design, installation and material requirement. Maintenance of irrigationand fogging systems. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application.

**Unit-V**

Green house climate measurement, control and management. Insect and disease management in greenhouse and net houses Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post harvest techniques; Economic analysis.

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# BTAG- 802: MECHANICS OF TILLAGE AND TRACTION

**UNIT- I**

Introduction to mechanics of tillage tools, methods of soil testing, engineering properties of soil, principles and concepts, stress strain relationship. Measurement of static and dynamic soil parameter and soil compaction and plant growth.

**UNIT- II**

Design of tillage tools principles of soil cutting, design equation, force acting on tillage tools such as MB plough & cultivator, application of dimensional analysis in soil dynamics of tillage tools. Measurement of draft of various tillage tools like passive and oscillatory.

**UNIT- III**

Introduction to traction and mechanics, off road traction and mobility, traction model,traction improvement, traction prediction.

**UNIT- IV**

Tyre size, tyre lug geometry and their effects, tyre testingVariability and geo statistic, application of GIS in soil dynamics.

**Unit-V**

Weight transfer and tractor loading including placement and traction aids; Studies on tyres, tracks and treads under different conditions, and soil compaction and number of operations.

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# BTAG- 803: AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL

**Unit I**

Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods.

**Unit II**

B.I.S standard for dairy, poultry, piggery and other farm structures. Design, construction, building materials, methods of cost estimation and cost estimation of farm residence, farm structures; animal shelters, compost pits, fodder silos, fencing and implements sheds, barn for cows, buffalos, and poultry etc.

**Unit III**

Rural living and development, rural roads, their construction cost and repair and maintenance, sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community.

**Unit IV**

Importance of storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures ( CAP, hermetic storage, Pusa bin, RCC ring bins),

**Unit V**

Design considerations for grain storage godowns, Bag storage structures, Shallow and Deep bins, Calculation of pressure in bins, Storage of seeds, Site and orientation of building in regard to sanitation, community sanitation system; sewage system and its design, cost and maintenance, design of septic tank for small family, Estimation of domestic power requirement, source of power supply and electrification of rural housing.

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# BTAG-804: CROP PROCESS ENGINEERING

**UNIT- I**

Scope and importance of food processing, principles and methods of food processing. Processing of farm crops; cereals, pulses, oil seeds, fruits and vegetables and their products for food and feed. Processing of animal products for food and feed.

**UNIT- II**

Principle of size reduction, grain shape, Size reduction machines; crushers, grinders, cutting machines etc. - operation, efficiency and power requirement – Rittinger's, Kick's and Bond's equation, fineness modulus.

**UNIT- III**

Theory of mixing, types of mixtures for dry and paste, materials, rate of mixing and power requirement, mixing index. Theory of separation, size and upsized separation, Types of separators, size of screens, sieve analysis, capacity and effectiveness of screens, pneumatic separation.

**UNIT- IV**

Theory of filtration, study of different types of filters, rate of filtration, pressure drop during filtration. Scope & importance of material handling devices,

**UNIT- V**

Study of different types of material handling systems; belt, chain and screw conveyor, bucket elevator, pneumatic conveying, gravity conveyor- design consideration, capacity and power requirement.

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PROJECT

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