

**CURRICULAR LAYOUT FOR THE DEGREE OF B.Sc. AGRICULTURAL  
ENGINEERING DEGREE**

**LEVEL-1, SEMESTER-1**

Course No.	Course Title	Credit	Contact Hours
CSM111	Mathematics I	3	3
PHY111	Physics	3	3
PHY112	Physics	1	2
CHEM111	Chemistry	3	3
CHEM112	Chemistry	1	2
FS112	Engineering Drawing (Civil)	1	2
LAN101	English	2	2
FPM114	Engineering Shop	1	2
SS105	Soil Science	2	2
SS106	Soil Science	1	2
<b>Total</b>		<b>18</b>	<b>23</b>

**LEVEL-1, SEMESTER-2**

Course No.	Course Title	Credit	Contact Hours
CSM121	Mathematics II	3	3
CSM123	Computer Science	2	2
CSM124	Computer Science	1	2
FPM121	Workshop Technology	1	1
FPM122	Workshop Technology	1	2
FPM124	Engineering Drawing (Mechanical)	1	2
AGRON121	Agronomy	2	2
AGRON122	Agronomy	1	2
FPM125	Engineering Mechanics	3	3
FS121	Surveying	2	2
FS122	Field Surveying	1	2
<b>Total</b>		<b>18</b>	<b>23</b>

**LEVEL-2, SEMESTER-1**

Course No.	Course Title	Credit	Contact Hours
CSM211	Mathematics III	3	3
AEC211	Agricultural Economics	2	2
FTRI211	Food Science	2	2
FTRI212	Food Science	1	2
IWM211	Fluid Mechanics	2	2
IWM212	Fluid Mechanics	1	2
FPM211	Thermodynamics	2	2
FPM212	Thermodynamics	1	2
FS211	Engineering Materials	2	2
FS212	Engineering Materials	1	2
CSM213	Computer Application	2	2
CSM214	Computer Application	1	2
<b>Total</b>		<b>20</b>	<b>25</b>

**LEVEL-2, SEMESTER-2**

Course No.	Course Title	Credit	Contact Hours
FPM221	Electrical Engineering	2	2
FPM222	Electrical Engineering	1	2
IWM221	Hydraulics	2	2
IWM222	Hydraulics	1	2
FPM223	Heat Engines	2	2
FPM224	Heat Engines	1	2
FS221	Strength of Materials	2	2
FS222	Strength of Materials	1	2

FS225	Material and Cost Estimation	2	2
RS221	Rural Sociology	2	2
HORT221	Horticultural Science	2	2
HORT222	Horticultural Science	1	2
STAT221	Statistics	2	2
STAT222	Statistics	1	2
<b>Total</b>		<b>22</b>	<b>28</b>

### LEVEL-3, SEMESTER-1

Course No.	Course Title	Credit	Contact Hours
FPM311	Agricultural Power	2	2
FPM312	Agricultural Power	1	2
FPM313	Electrical Machinery	2	2
FPM314	Electrical Machinery	1	2
IWM311	Irrigation and Drainage Engineering	3	3
IWM312	Irrigation and Drainage Engineering	1	2
IWM313	Groundwater Engineering	2	2
IWM314	Groundwater Engineering	1	2
FS311	Soil Mechanics	2	2
FS312	Soil Mechanics	1	2
FS313	Concrete Structure Design	3	3
FS314	Concrete Structure Design	1	2
<b>Total</b>		<b>20</b>	<b>26</b>

For students from Level – 3, Semester – 2 to Level – 4, Semester –2, in each semester the following instructions are to be followed: a) Common courses are to be taken by all. B) For the remaining credits, out of 4 sets of courses (Set-A, Set-B, Set-C & Set-D) one has to choose one set and once one set is chosen, he/she has to follow the same set up to the last semester.

### LEVEL-3, SEMESTER-2

#### Common Courses:

Course No.	Course Title	Credit	Contact Hours
FPM321	Agricultural Machinery	3	3
FPM322	Agricultural Machinery	1	2
FPM323	Rural Electrification Engineering	2	2
FPM324	Rural Electrification Engineering	1	2
FS321	Environmental Engineering	2	2
FS322	Environmental Engineering	1	2
Ag.Ext321	Agricultural Extension Education	2	2
Ag.Ext322	Agricultural Extension Education	1	2
<b>Sub Total</b>		<b>13</b>	<b>17</b>

#### Set-A: CSM (Computer Science & Mathematics)

CSM321	Algorithm	2	2
CSM323	Engineering Mathematics	2	2
CSM325	Internet Programming	2	2
Sub Total-		6	6
<b>Total</b>		<b>13+6=19</b>	<b>17+6=23</b>
<b>Total No. of Courses</b>		<b>11</b>	

#### Set-B: FPM (Farm Power & Machinery)

FPM325	Heat and Mass Transfer	2	2
FPM327	Refrigeration and Air Conditioning Engineering	2	2
FPM328	Refrigeration and Air Conditioning Engineering	1	2
Sub Total-		5	6
<b>Total</b>		<b>13+5=18</b>	<b>17+6=23</b>
<b>Total No. of Courses</b>		<b>11</b>	

#### Set-C: FS (Farm Structure)

FS323	Solid Waste Management	2	2
FS324	Solid Waste Management	1	2

IWM323	Agricultural Meteorology	2	2
	Sub Total-	5	6
	Total	13+ 5 = 18	17 + 6 =23
	Total No. of Courses	11	

**Set-D: IWM (Irrigation & Water Management)**

IWM321	Hydraulic Engineering	2	2
IWM322	Hydraulic Engineering	1	2
IWM323	Agricultural Meteorology	2	2
	Sub Total-	5	6
	Total	13+ 5 = 18	17 + 6 =23
	Total No. of Courses	11	

**LEVEL-4, SEMESTER-1**

**Common Courses**

Course No.	Course Title	Credit	Contact Hours
FPM401	Agricultural Mechanization	2	2
IWM401	Pumps and Wells	2	2
IWM402	Pumps and Wells	1	2
IWM403	Soil and Water Conservation Engineering	3	3
IWM404	Soil and Water Conservation Engineering	1	2
CSM402	Computer Aided Design	1	2
	Sub total-	10	13

**Set-A: CSM (Computer Science & Mathematics)**

Course No.	Course Title	Credit	Contact Hours
CSM403	Database Management Systems	2	2
CSM405	Electronics and Instrumentation	2	2
FPM403	Agricultural Process Engineering	2	2
FPM404	Agricultural Process Engineering	1	2
CSM410	Project Work and Seminar	1	2
	Sub total-	8	10

**Elective Courses: Two credits from the following courses**

Course No.	Course Title	Credit	Contact Hours
CSM407	Multimedia Systems	1	2
CSM409	Discrete Mathematics	2	2
CSM411	Engineers and Society	2	2
CM401	Accountancy	2	2
FPM413	Precision Agriculture	2	2
FPM414	Precision Agriculture	1	2
CSM413	Microprocessor Systems	2	2
CSM415	Electronic Devices and Circuits	2	2
	Total	10+8+2 =20	

**Set-B: FPM (Farm Power & Machinery)**

FPM403	Agricultural Process Engineering	2	2
FPM404	Agricultural Process Engineering	1	2
FPM405	Machine Design	2	2
FPM410	Project Work and Seminar	1	2
	Sub total	6	8

**Elective courses: Three credits (two courses) from the following courses**

CSM405	Electronics and Instrumentation	2	2
CSM406	Electronics and Instrumentation	1	2
FPM407	Manufacturing Methods and Quality Control	2	2
FPM408	Manufacturing Methods and Quality Control	1	2
CM417	Agribusiness and Marketing	2	2
FPM411	Soil Dynamics and Tillage	2	2
FPM412	Soil Dynamics and Tillage	1	2
FPM413	Precision Agriculture	2	2
FPM414	Precision Agriculture	1	2
CM401	Accountancy	2	2
	Total	10+6+3=19	

**SET-C: FS (Farm Structure)**

FS411	Water Pollution and Treatment	2	2
FS412	Water Pollution and Treatment	1	2
FPM403	Agricultural Process Engineering	2	2
FPM404	Agricultural Process Engineering	1	2
FS410	Project Work and Seminar	1	2
<b>Sub total</b>		<b>7</b>	

**Elective courses : Two credits from the following courses**

FS415	Foundation Engineering	2	2
FS417	Applied Soil Mechanics	2	2
CM401	Accountancy	2	2
CM417	Agribusiness and Marketing	2	2
<b>Total</b>		<b>10+7+2=19</b>	

**Set-D: IWM (Irrigation & Water Management)**

IWM405	Hydrology	3	3
IWM406	Hydrology	1	2
IWM407	Hydraulic Machinery	2	2
IWM408	Hydraulic Machinery	1	2
IWM410	Project Work and Seminar	1	2
<b>Sub Total</b>		<b>8</b>	<b>11</b>

**Elective courses: Two credits from the following courses**

SS403	Soil Physics	2	2
CSM403	Database Management systems	2	2
CM401	Accountancy	2	2
LAN401	Communication Skill	2	2
<b>Total</b>		<b>10+8+2=20</b>	

**LEVEL-4, SEMESTER-2****Common Courses**

Course No.	Course Title	Credit	Contact Hours
FPM421	Engineering Management	2	2
IWM421	On-Farm Water Management	2	2
IWM422	On-Farm Water Management	1	2
<b>Sub Total</b>		<b>5</b>	<b>6</b>

**Set-A: CSM (Computer Science & Mathematics)**

CSM421	Digital Circuits	2	2
CSM423	Operations Research	2	2
CSM425	Computer Network	2	2
CSM430	Project Work and Report	3	6
<b>Sub total</b>		<b>9</b>	<b>12</b>

**Elective Courses: Four credits (two courses) from the following courses**

CSM427	Computer System Administration	2	2
CSM429	Operating Systems	2	2
FPM429	Project Planning and Evaluation	3	3
CSM433	Network Management	2	2
CSM435	Computer Graphics	2	2
CSM437	GIS and ICT	2	2
CSM438	GIS and ICT	1	2
<b>Total</b>		<b>5+9+4=18</b>	

**Set-B: FPM (Farm Power & Machinery)**

FPM423	Bio-Materials and Systems	3	3
FPM425	<b>Agricultural Machinery Design</b>	2	2
FPM427	Testing and Standardization of Agril. Machinery	2	2
FPM428	Testing and Standardization of Agril. Machinery	1	2
FPM432	Industrial Training	1	2
FPM430	Project Work and Report	3	6

		<b>Sub Total-</b>	<b>12</b>	<b>17</b>
<b>Elective Courses: Three credits from the following courses</b>				
CSM437	GIS and ICT		2	2
CSM438	GIS and ICT		1	2
FPM433	Ergonomics		2	2
FPM434	Ergonomics		1	1
FPM435	Livestock and Poultry Machinery		2	2
FPM436	Livestock and Poultry Machinery		1	2
FPM437	Technology, Gender and Development		3	3
Ag.Ext429	Extension Communication Management		3	3
FPM429	Project Planning and Evaluation		3	3
FS421	Farm Building Design		2	2
FS422	Farm Building Design		1	2
		<b>Total</b>	<b>5+12+3=2</b>	
<b>Set-C:FS (Farm Structure)</b>				
FS421	Farm Building Design		2	2
FS422	Farm Building Design		1	2
FS423	Silo and Storage Structure		2	2
FS424	Silo and Storage Structure		1	2
FS425	Environmental Impact Assessment		2	2
FS426	Environmental Impact Assessment		1	2
FS430	Project Work and Report		3	6
		<b>Total</b>	<b>12</b>	<b>18</b>
<b>Elective courses: Three credits from the following courses</b>				
FS427	Rural Housing and Sanitation		2	2
FS428	Rural Housing and Sanitation		1	2
FPM423	Bio-Materials and Systems		3	3
CSM437	GIS and ICT		2	2
CSM438	GIS and ICT		1	2
		<b>Total</b>	<b>5+12+3=2</b>	
<b>Set-D:IWM (Irrigation &amp; Water Management)</b>				
IWM423	Irrigation Structure		3	3
IWM424	Irrigation Structure		1	2
IWM425	Flood Control and River Training		2	2
IWM426	Flood Control and River Training		1	2
IWM427	Land and Watershed Management		2	2
IWM430	Project Work and Report		3	6
		<b>Sub Total</b>	<b>12</b>	<b>17</b>
<b>Elective course: Two credits from the following courses</b>				
IWM429	Aquacultural Engineering		2	2
IWM431	Land Reclamation Engineering		2	2
CSM437	GIS and ICT		2	2
		<b>Total</b>	<b>5+12+2=19</b>	<b>25</b>

**Total of credits required for the degree = 155**

**Note: The odd and even numeric figures in the course code indicate theory courses and practical courses, respectively.**

## SYLLABUSES FOR THE B.Sc. AGRICULTURAL ENGINEERING COURSES

<b>CSM 111 Mathematics-I</b>	<b>Credit - 3</b>
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*Differential Calculus:* Review: function; limit of a function; continuity and differentiability of functions; successive differentiation; physical applications of first and second order derivatives; Leibnitz's theorem; expansion of functions; Rolle's theorem; mean value theorem; Taylor's theorem and Maclaurin's theorem (proof not required); maxima and minima for functions of one and two variables; functions of several variables; partial differentiation; tangent; normal and curvature. *Integral Calculus:* Review of indefinite integrals; definite integrals; properties of definite integrals; gamma and beta functions; integration by reduction, integrals with several variables; rectification; quadrature; surface areas and volumes of revolution. *Matrices:* Introduction; transpose of matrix; adjoint and inverse of a matrix; solution of linear equations by matrices; rank of a matrix; symmetric and skew-symmetric matrix; Hermitian matrix; orthogonal matrix.

<b>PHY 111 Physics</b>	<b>Credit- 3</b>
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General Properties of matter: Elasticity, surface tension and viscosity. Heat and Thermodynamics: First law of thermodynamics and its applications, different kinds of thermo- dynamical changes, interrelation between pressure, volume and temperature. Second law of thermodynamics; reversible and irreversible processes, heat engine and Carnot's cycle. Electricity and Magnetism: Current and resistance, Kirchhoff's laws on distribution of current. Magnetic induction due to current, Ampere's law, Biot-Savart law. Electromagnetic induction, Henry-Faraday's law, inductance, L-R circuits. Nuclear Physics and Electronics : Nuclear physics- Atomic and nuclear structure, radioactivity, decay law, half life, nuclear fission and fusion, uses of radio isotopes.

<b>PHY 112 Physics</b>	<b>Credit-1</b>
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Determination of Y (Young's modules) by Searle's method. Determination of modulus of rigidity by dynamic method. Determination of 'g' by Kater's pendulum. Determination of surface tension by capillary rise. Comparison of magnetic moments of two bar magnets in tan A and tan B position by deflection method.. Comparison of magnetic moments of two bar magnet by null method. Determination H by Vibration magnetometer. Determination of refractive index of liquid by a plane mirror and a convex lens. Verification of laws of combination of resistance by P.O. Box.

<b>CHEM 111 Chemistry</b>	<b>Credit-3</b>
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Chemical equilibrium: Law of mass action and its application in homogenous and heterogenous reactions. Electrochemistry : Ionic equilibrium, Ostwalds law, common ion effect, electrolytic dissociation and conductance theories of strong electrolyte, pH, Buffer solution and its preparation, indicator, solubility product, principles of precipitation. Preparation of solution: Colligative properties of dilute solutions. Colloids: Preparation, properties and uses of colloids. Colorimetric analysis : Lambert's and Beer's law and their applications. Production of urea from natural gas. Petroleum refining and uses of different fractions. Environmental chemistry and pollution: Aromatic and heterocyclic compounds. Carbohydrates: Chemistry of monosaccharide and disaccharides.

<b>CHEM112 Chemistry</b>	<b>Credit-1</b>
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Preparation of standard solution of different compounds like  $\text{Na}_2\text{CO}_3$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{C}_2\text{O}_4$  and  $\text{KMnO}_4$  .Acid-base titration, redox titration, complexometric titration. Identification of organic compounds and their functional groups: Oxalic, citric, tartaric, acetic, formic acid, glucose, urea and carbonyl compounds

<b>FS112 Engineering Drawing (Civil)</b>	<b>Credit-1</b>
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Introduction: History, Applications, Instruments, Lines, Arrows, Dimensions and Symbols Lettering: Definition, Types, Uses, Single and Double stroke lettering. Scale: Definition, Types, Uses, Plane and Diagonal scale construction. Views: Definition, Types and Uses. Orthographic View: definition, Principles, Surfaces of solid sections, Drawing procedure and Uses. Isometric View: Definition, Drawing of solids, Orthographic views from . Isometric views and Uses. Building drawing: Foundation, Superstructure, Lintel with sunshade, Beam, Roof, Staircase, Construction plans and layouts of Farm house and Storage structure.

<b>LAN101 English</b>	<b>Credit-2</b>
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Textual study and comprehension practice from a prescribed text. Socio-linguistic rules to perform language function in English. Basic grammatical structures: Types of constructional forms of sentences; Sequence of tense; Voice; Verbs; Verb patterns and verb modifiers; Syntax; Combination of Sentences; Framing of question sentences. Nouns and determiners; Adjectives; Adverbial and repositional phrases. Mechanics: Punctuation; Quotation marks; Capitalisation. Principles and methods of composition.

<b>FPM 114 Engineering Shop</b>	<b>Credit - 1</b>
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Carpentry: Identification of machine and hand tools required for carpentry shop. Wood working practices: Making joint and finished articles. Surface finish, parallelism and angular measurements. Blacksmithy: Machine shop: Practical works on the lathe, shaper and planers, measuring tools, drills and drilling machines, Checking of surfaces. Vee blocks, Gauge blocks. Welding & Brazing: Selection of equipment, brazing-processes and equipment, filler metal flux, joint design, soldering-materials & methods, flame cutting of metals, operation, profile cutting machine. Foundry: Pattern and moulds, moulding bed, casting of ferrous and non-ferrous metals. Tolerances and allowances.

<b>SS105 Soil Science</b>	<b>Credit - 2</b>
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Introduction: Concept of soil, major components of soil; Soil genesis: Rocks and minerals – classification and properties; Weathering - physical and chemical weathering; Soil forming factors – climate, biosphere, parent material, relief and time Soil profile; Soil properties: Physical –soil particles, soil texture, soil structure, particle density, bulk density, porosity; Chemical – soil pH, ion exchange in soil; Biological – soil organisms and their importance; Soil fertility and plant nutrition: Plant nutrients – criteria of essentiality, source, and available forms; Soil organic matter – sources and functions; Soil water: Importance, classification, soil water constants, evapotranspiration; Agro-ecological zones of Bangladesh: Concept, location, extent and crops grown; Problem soils of Bangladesh.

<b>SS106 Soil Science</b>	<b>Credit - 1</b>
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Collection and preparation of soil samples; Identification of important rock and mineral specimen; Determination of particle density of soil by volumetric flask method; Determination of bulk density of soil by core sampler method; Determination of soil pH by glass electrode pH meter; Determination of soil organic carbon by wet oxidation method.

<b>CSM 121 Mathematics-II</b>	<b>Credit - 3</b>
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*Differential Equations*: Definition; types of differential equations; formation of differential equations; solution of first order and first degree equations; solution of linear differential equations of second and higher orders with constant coefficients; method of variation of parameters; solution of homogeneous linear equations; solution of differential equations in series (Frobenius method); *Co-ordinate geometry*: Co-ordinates of a point in space; distance between two points; direction cosines and direction ratios of a straight line; angle between two straight lines; condition of perpendicularity and parallelism of two straight lines, sphere and conicoid; *Numerical analysis*: Introduction; solution of algebraic and transcendental equations; interpolation and extrapolation; numerical differentiation and integration; numerical solution of ordinary differential equations.

<b>CSM 123 Computer Science</b>	<b>Credit - 2</b>
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Computer fundamentals: computer systems; number systems and their internal representations; binary arithmetic; information coding; introduction to digital circuits and their design; programming fundamentals; control structures; variable modifiers; pointer variables; functions; arrays; characters and strings; structures; recursive functions; disc I/Os; introduction to data structure and object oriented programming.

<b>CSM 124 Computer Science</b>	<b>Credit - 1</b>
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Familiarity with computer peripherals; use of different systems software; text processing; program writing and terminal use based on CSM123.

<b>FPM 121 Workshop Technology</b>	<b>Credit - 1</b>
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Metrology, Fits and tolerance, Measuring and gauging instruments and their uses, Nondestructive testing and inspection. Metal Working Processes. Metal Working Principles: Turning, Shaping, Planning, Drilling, Grinding, Welding and allied processes; Threads and thread cutting; Hot and cold working of metal. Basic Machine tools

elements: Machine frame, Drive, Work-holding devices, Methods of feed and depth control. Machines: Lathe, shaper, milling, jigs and fixtures, grinding machine and planing machines.

<b>FPM 122 Workshop Technology</b>	<b>Credit - 1</b>
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Identification and use of various measuring and gauging instruments. Identification of various components, processes and operation of metal working machines. \*Cutting tool shaping and fitting. Cutting speed and feed, cutting time. \*Safety and protection in the workshop.

<b>FPM 124 Engineering Drawing (Mechanical)</b>	<b>Credit – 1</b>
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Orthographic drawing and sketching: Pictorial drawing & sketching, intersections and developments; dimensions, tolerances, fits and clearances, limits and precision; screw, threads and threaded fasteners; working drawings; drawing of jigs, fixtures, welded parts, gears and cams; sections of solids, conic sections, loci, spiral curves, log spirals, etc.; preparation of a complete dimensioned scale drawing of agricultural machinery and assemblies. Plan, elevation and cross-sectional view of solid objects.

<b>AGRON 121 Agronomy</b>	<b>Credit – 2</b>
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Introduction to Agronomy: Definition and scope of Agronomy. Relationship of Agronomy with other branches of Agriculture; Climatology: Concept of weather and climate. Effect of temperature, day length and solar radiation on growth, development and yield of crops. Cropping seasons of Bangladesh and their characteristics; Crops and Cropping Systems: Agronomic classification of crops. Methods of cropping. Crop suitability in different agro-ecological zones in Bangladesh. Distribution of crops in relation to season, soil and land topography; Tillage: Concept, objectives and types of tillage. Characteristics of ideal tillage. Effect of tillage on soil characteristics and nutrient availability. Determinants of time, depth and number of ploughing; Plant Nutrition: Plant nutrient elements, their sources and forms of absorption. Functions and deficiency symptoms of nutrient elements in crop plants. Manures and fertilizers and their methods of application; Seed and seedling: Definition and classification of seed. Attributes of seed quality. Importance of quality seed in crop production. Factors affecting seed rate and depth of seeding. Effect of plant density and planting geometry on crop growth, seed yield and quality. Seed processing and grading. Seed treatment. Maintenance of seed quality during seed processing and storage; Water Management: Definition, objectives and methods of irrigation and drainage. Water use efficiency and irrigation scheduling; Intercultural Operations: Weeding, mulching, thinning, earthing up- their objectives, methods, advantages and disadvantages; Production Technology of Crops: Origin and distribution botanical description, climate and soil requirements, variety selection, cultivation practices and post-harvest operations of the following crops- rice, wheat, maize, sugarcane, jute, mustard, groundnut, soybean and lentil. Points to be considered during production and processing of crops for seed and for grain; Mechanization of Agriculture: Present status, problems and prospects of mechanization of Agriculture in Bangladesh.

<b>AGRON 122 Agronomy</b>	<b>Credit – 1</b>
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Identification and study of farm implements; Identification and study of crops; Identification and study of seeds; Identification and study of weeds; Identification and study of manures and fertilizers; Practising ploughing and determination of efficiency of plough; Practising weeding, thinning and gap filling; practising mulching operation; Practising different methods of application of manures and fertilizers; Methods of seed sampling; Methods of seed grading; Methods of seed treatment; Conducting crop cutting experiment and calculation of expected yield of crops; Study of the effect of plant nutrients/seed rate/planting density, planting geometry on the performance of a crop in students' plot.

<b>FPM 125 Engineering Mechanics</b>	<b>Credit- 3</b>
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*Statics:* Force systems: Force, moment, couple, resultant of forces. Equilibrium: Free body diagram, equilibrium conditions and its applications. Friction and frictional force systems, friction in machines. Centroids, center of mass, area and mass moment of inertia, product of inertia. Structures: Simple trusses, frames and machine, beams with concentrated and distributed loads.

*Dynamics:* Kinematics of particles: Rectilinear motion, plane curvilinear motion, different coordinates, relative motion. Kinetics of particles: Force, mass and acceleration; pendulum; work and energy; impulse and momentum; impact; steady and variable mass flow. Kinematics of rigid bodies: Combined sliding and rolling, Mechanism- slider crank, quick return, Link; 3-bar and 4-bar linkage. Kinetics of rigid bodies: Gyroscopic motion and precision.

<b>FS 121 Surveying</b>	<b>Credit-2</b>
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Types and Instruments of surveying. Chain survey: Plotting details, Errors, Merits and demerits. Traverse survey:



Procedures, Bearing measure and plotting, Errors and adjustment, Merits and demerits Plane Table survey: Orientation, Merits and demerits, Two and three point problems. Levelling: Objectives, Methods, Reduced level, Effects of curvature and refraction and their corrections. Contouring: Characteristics and uses, Direct and indirect methods. Cadastral survey: instruments, procedures and land settlement and map preparation. Curves: Types, Curve components, Setting of circular, transition and vertical curves, Super elevation and Shift. Project survey: Classification, Irrigation and Canal projects

<b>FS 122 Field Surveying</b>	<b>Credit-1</b>
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Chain survey: Location of stations, setting offsets and plotting. Land survey: segmentation and measurement of land area. Traversing: Measurement of bearings, setting stations, plotting and error correction. Plane tabling: Location of objects by radiation and intersection methods. Levelling: Measurement of land undulation and cut-fill measure. Contouring: Setting of contour lines and volume measure of depressed area. Curve ranging: Setting curves for roads and canals for minimal turning risks. Canal project: Setting canal alignment, measurements of reduce levels, plotting canal way. Irrigation project: Setting grids, measurement of elevations at grid corners, cut-fill volume.

<b>CSM 211 Mathematics-III</b>	<b>Credit- 3</b>
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Fourier series & Fourier integrals: Trigonometric series; the Euler-Fourier formula; expansion of functions into Fourier series; half range expansions; the Fourier integrals; Fourier series. Legendre polynomial: Legendre polynomial from Legendre equation; recurrence formula for Legendre polynomial, Rodrigues formula; Orthogonality of Legendre polynomial; generating function. Bessel's functions: Derivation of Bessel's function from the solution of Bessel's equation; recurrence formula for Bessels functions; orthogonal properties of Bessel's functions. Vector calculus: Scalar & vector functions; gradient of a scalar function; curl & divergence of a vector function; Green's theorem; Gauss's divergence theorem and Stokes theorem.

<b>AEC 211 Agricultural Economics</b>	<b>Credit- 2</b>
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Scope of economics, basic concepts of economics and agricultural economics. Theory of consumer behaviour: Marshallian Utility analysis, Indifference curve analysis and elasticity of demand. Theory of Production: Factors of production, Law of diminishing returns. Stages of production, Optimum input use, Cost and revenue concepts, Markets and their characteristics, Price determination under different market conditions. Concepts and measurement of national income, Difficulties of measuring national income in Bangladesh, Role of agriculture in the economic development of Bangladesh, Problems of agricultural development in Bangladesh.

<b>FTRI 211 Food Science</b>	<b>Credit- 2</b>
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Introduction to food science. Food and nutrition . Proteins, carbohydrates, fats, vitamins, minerals and water - sources, classification and functions. Chemical reactions: Oxidation, Nonenzymatic browning; Enzyme reactions. Microbial activity: Characteristics of microbes; effect of microbes on food. Food borne diseases: food infection and food intoxication and food poisoning. Principles and methods of food preservation: Use of low temperature; use of high temperature. chemical additives; irradiation of foods etc.

<b>FTRI 212 Food Science</b>	<b>Credit- 1</b>
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Proximate analysis, Microbial load calculation, processing of fruits and vegetables for different products. Preparation of tin cans, seaming, double seaming etc.

<b>IWM 211 Fluid Mechanics</b>	<b>Credit-2</b>
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General properties of fluid. Principles of hydrostatic pressure: Unit pressure, Resultant pressure, Pascal's Law, Free surface of a liquid, Atmospheric, absolute and gage pressure, Pressure head, Vapor pressure, Manometer, Micro-manometer, Piezometer. Buoyancy of fluid: Principle of Archimedes, Condition of equilibrium of floating bodies, Determination of metacentric height, Floating bodies, Flow of fluids, Path lines and stream tubes, Laminar and turbulent flow, Equation of continuity, Velocity head and total head of a fluid, Steady and unsteady flow and Uniform and non-uniform flow.

<b>IWM 212 Fluid Mechanics</b>	<b>Credit-1</b>
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Determination of location of center of pressure for a submerged plane surface. Determination of metacentric height of a floating body. Problems on fundamental properties of fluid. Problems on atmospheric, absolute and gage pressure. Problems on manometers. Problems on total pressure on plane surfaces. Problems on total pressure on curved surfaces. Problems on buoyancy.

<b>FPM 211 Thermodynamics</b>	<b>Credit-2</b>
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Elementary thermodynamics of perfect gases, energy equations, laws of thermodynamics and their application, entropy and enthalpy, thermodynamic processes, gases and single phase system, steam and two phase system, steam plant, steam turbines, air compressors, ideal gas cycles, refrigeration, Calorimetry. Different thermodynamics processes, laws, ideal cycles, use of steam and gas tables. Study on refrigeration system.

<b>FPM 212 Thermodynamics</b>	<b>Credit-1</b>
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Problems on elementary thermodynamics of perfect gases, energy equations, laws of thermodynamics and their application, entropy and enthalpy. Problems on steam turbines, air compressors, ideal gas cycles, refrigeration, Calorimetry. Problems on the application of the processes, laws, ideal cycles, steam and gas tables.

<b>FS 211 Engineering Materials</b>	<b>Credit-2</b>
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Introduction: selection and use of engineering materials. Bricks: manufacturing, drying, burning, characteristics, tests, classification and uses. Lime: Type, uses, tests and lime concrete. Cement:, composition, manufacture, properties and tests of port land cements. Sand: Cement concrete: tests and design of concrete mix. Iron and steel: Ores, types, properties, uses, manufacturing and quality control. Timber: Definition, wood structure, volume measure, characteristics, defects, seasoning and timbers of Bangladesh. Miscellaneous materials: Tiles, plastics, fibreglass, ferro-cement, paints and varnishes.

<b>FS 212 Engineering Materials</b>	<b>Credit-1</b>
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Water absorption and crushing strength of brick. Unit weight and fineness modulus of sand. Normal consistency and setting times of Portland cement. Compressive and tensile strength of cement mortar. Measurement of workability of concrete mix. Compressive and tensile strengths of concrete cube and cylinder. Visit to brickfield.

<b>CSM213 Computer Application</b>	<b>Credit- 2</b>
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Web page design using FrontPage ,HTML tools and its resources ,linking, style, and publishing. XML fundamentals ,XML parsers ,XML API. Java basics and networking using Java, Java classes, java script, Java's security. VB basics, VB script, Introduction to CGI programming, Perl interpreter, Perl Language, packages, modules and objects. Introduction to ASP, Application of ASP.

<b>CSM214 Computer Application</b>	<b>Credit- 1</b>
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Web page design using HTML, XML and FrontPage; JavaScript programming; Introduction to CGI and Perl language; ASP concepts; Network programming with Java.

<b>FPM 221 Electrical Engineering</b>	<b>Credit – 2</b>
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DC Circuit:, fundamentals of current, voltage, resistance and their units, Ohm's law and Kirchoff's laws. Series and parallel circuits. Network Analysis: Superposition and Thevenin's theorems, Magnetic Circuits: AC Circuits: R branch, L branch and C branch, RLC branch, RMS & average values, vector diagram. Phasor Algebra. Operators, addition, subtraction, multiplication and division. Single phase circuit analysis. Electronics: Atomic structure and energy bands in solids. P-n-p and n-p-n transistors circuits, signal power amplifiers,filtering. Integrated circuits: Feedback amplifier and Oscillators. Control applications in instrumentation and agriculture.

<b>FPM 222 Electrical Engineering</b>	<b>Credit – 1</b>
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Elementary circuit and wiring, Use of voltmeter, ammeter and multi meter, Series and parallel circuits, Electric power distribution, Use of wattmeter and energy meter, Verification of superposition theorem, Verification of Thevenin's theorem, Study of RLC circuit, Half wave and full wave rectification, Small signal application, Design of control circuits, Study of applications in instrumentation.

<b>IWM 221 Hydraulics</b>	<b>Credit – 2</b>
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Fluid flow equations: Euler's equation, Bernoulli's energy equation, Flow of gases; Flow through orifices; Flow over notches and weirs; Time of emptying a reservoir with rectangular weir; Flow through pipes; Head loss in pipe flow; Flow in pipe networks; Introduction to open channels; Energy in open channel, Cross section of greatest efficiency.

<b>IWM 222 Hydraulics</b>	<b>Credit – 1</b>
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Determination of coefficients of orifices, notches and weirs, venturimeter and pipe friction; Verification of Bernoulli's energy equation; Study of hydraulically operated control gates, and different flow types; Problems on fundamentals of fluid flow, orifice, notch and weirs, pipes and open channels.

<b>FPM 223 Heat Engine</b>	<b>Credit – 2</b>
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Basic Engine types and their operation. Combustion and Fuels for ICE, knock and the engine variables. Fuel metering in SIE and CIE, IC Engine Characteristics and design, Major components and systems. Spark-Ignition and Compression Ignition Engines, Engine performance, exhaust gas analysis and air pollution. General study on engines, Study on cooling, lubrication and Ignition systems, Two stroke, four stroke engine cycles and valve timing diagram, Study on injector, carburetor and fuel pump, Performance test of injector, Analysis of exhaust gas and Engine tuning.

<b>FPM 224 Heat Engine</b>	<b>Credit – 1</b>
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Major components and systems. Spark-Ignition and Compression Ignition Engines, exhaust gas analysis and air pollution. General study on engines, Calculation of  $I_p$  and  $B_p$  and energy balance, Study on cooling, lubrication and Ignition systems, Two stroke, four stroke engine cycles and valve timing diagram, Study on injector, carburetor and fuel pump, Performance test of injector, and Engine tuning.

<b>FS 221 Strength of Materials</b>	<b>Credit-2</b>
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Introduction: Elasticity, deformation, poisson's ratio, mechanical properties, stress-strain relationship. Stress: shear and combined stresses, nature and causes of failure, allowable and working stresses. Shear force and bending moment: concentric and inclined loading on horizontal and inclined beams, thrust diagram. Deflection of beam: stress and deflection of helical spring, hoop-stresses. Torsion, torsion in circular and hollow shafts. Principal stress:, stress-strains, mohr's circle, analytical and graphical solutions for stress system in horizontal and inclined plains. Column and Strut:Euler's formula.

<b>FS 222 Strength of Materials</b>	<b>Credit-1</b>
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Reconnaissance of material-testing laboratory and draw the layout. Hardness number of metallic plates. Shear modulus of a helical spring. Tensile strength of mild steel rods. Shearing strength of metallic wires. Deflection of wooden beam. Flexural strength of reinforced concrete slab and beam. Impact test by penetrometer.

<b>FS 225 Material and Cost Estimation</b>	<b>Credit-1</b>
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Water absorption and crushing strength of brick. Unit weight and fineness modulus of sand Normal consistency and setting times of Portland cement. Compressive and tensile strength of cement mortar. Measurement of workability of concrete mix. Compressive and tensile strengths of concrete. Works, materials and cost estimation of a building.

<b>RS 221 Rural Sociology</b>	<b>Credit-2</b>
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Origin and Development of Rural Sociology; Scope, Importance Role of the Rural Sociologists in Agricultural Development. Methods and Techniques of Social Research: Scientific research methods, importance, value judgement and ethical issues, types, research process, sampling, mode of data collection and analysis of social data. Culture: Meaning, importance and function, elements, Cultural universals and variability, ethnocentrism and relativism. Rural Social Differentiation, Stratification and Rural Power Structure: Society, Technology and Rural Social Change. Rural social policy and planning and rural development.

<b>HORT 221 Horticultural Science</b>	<b>Credit - 2</b>
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Introduction to Horticulture: Definition, branches, importance and scope of horticulture; Propagation of horticultural crops: Advantages, disadvantages, method and techniques, construction of green house, lath house and mist house; Production technology of the following horticultural crops: Production statistics, soil climate, varieties, propagation, cultural practices, pest management and harvesting of banana, papaya, pineapple, mango, jackfruit, litchi, potato, tomato and cauliflower; Harvesting and post harvest handling of horticultural crops: Harvesting, curing, grading, packing, processing, shipment and marketing of horticultural produces.

<b>HORT 222 Horticultural Science</b>	<b>Credit-1</b>
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Lay out and designing of green house, lath house and mist house; identification and use of nursery equipments; identification of horticultural crops; preparation of seedbed and seedling raising; methods of planting of horticultural crops; propagation practices of different horticultural crops.

<b>STAT 221 Statistics</b>	<b>Credits-2</b>
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Variables, Frequency distribution, Measures of location and variation and shape characteristics of curves. Random experiment: outcome, sample space, events. Laws of probability. probability distribution. Probability function. Simple correlation and regression: Pearson's correlation coefficient, least squares method for fitting regression line. Population and sample, null and alternative hypotheses; Level of significance. Basic steps for testing hypothesis. Statistical tests: Significance of correlation and regression coefficients, independence of attributes. Statistical Quality Control.: Product control vs. process control, Problems and principles of statistical quality control. Construction of different types of control chart. Producer's risk and consumer's risk, OC and ASN functions. Experimental design: Basic concepts and principles.

<b>STAT 222 Statistics</b>	<b>Credit-1</b>
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Frequency tables and their graphical representation. Measures of location and variation. Moments. Measures of skewness and kurtosis. Pearson's correlation coefficient. Fitting linear regression to observed data by the method of least squares. Statistical tests: A population mean is equal to a specified value, equality of two population means (for both independent & correlated samples), a population proportion is equal to a specified value, equality of two population proportions, independence of attributes, significance of correlation and regression coefficient. Analysis of variance for completely randomized and randomized block designs. Multiple comparison (using t and lsd). Construction of different types of control chart.

<b>FPM 311 Agricultural Power</b>	<b>Credit-2</b>
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Classification of tractors & their selection for proper utilization in field operation, Tractors fuels, Octane and Cetane rating of fuels; combustion of fuels and exhaust gas analysis, Power transmission elements, shafting and universal joints; gear and pinion, belt- pulleys tractor power transmission & final drive, PTO, clutches, brakes and steering systems, Hydraulic system and their controls, Stability of tractor, weight transfer, Traction theory: Traction and traction efficiency, rolling resistance, wheel slip, draft-speed relationship of tractor for different soil conditions, ballasting.

<b>FPM 312 Agricultural Power</b>	<b>Credit-1</b>
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Familiarity with the tractors & power tillers available in Bangladesh, Adjustment & maintenance works on fuel systems, lubrication system, ignition system, power transmission system & cooling system of tractors and power tillers, Tractor & Power tiller driving with special preference to selection of gears, position of differential lock, drawbar & PTO shaft, clutch & their operating mechanisms, Study of tractor brakes and steering systems, Adjustment of hitch systems for position and draft control during field operations, Measurement of engine power, Exhaust gas analysis.

<b>FPM 313 Electrical Machinery</b>	<b>Credit-2</b>
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Transformers: equivalent circuits, open circuit and short circuit tests. Three phase transformers & auto transformers. Rotating machines: Introduction to DC and AC machines. DC machines: Generator and motor analysis. Synchronous machines: Equivalent circuit, short circuit and open circuit characteristics and power angle characteristics, synchronous motors and V-curves; Induction Motors: Equivalent circuit analysis, squirrel cage and wound rotor motors, and motor applications. Speed control; Fractional horsepower AC Motors: Single phase induction motors. Starting and running performances, universal and capacitor motors. Selection of motors.

<b>FPM 314 Electrical Machinery</b>	<b>Credit-1</b>
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Short circuit and open circuit tests of transformer, Experimental determination of voltage regulation and efficiency of a transformer, Construction of a three phase transformer using three single phase transformers, Building up of a shunt generator, Study of speed control of D.C. shunt motors, Study of three phase squirrel cage motor, Study of three phase wound rotor motor, No load & blocked rotor test of 3 phase induction motor, Study of single phase induction motor, Starting and operation of universal and

capacitor motors.

<b>IWM 311 Irrigation and Drainage Engineering</b>	<b>Credit – 3</b>
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Necessity, scope and history of irrigation; Soil-water-plant relationship; Consumptive use and irrigation water requirement of crops; Scheduling of irrigation water; Water application methods and irrigation efficiencies; Design of field irrigation systems; Irrigation water distribution-Canals and buried pipes; Quality of irrigation water; Salt problems in irrigated agriculture; Drainage for agriculture; Drainage systems; Tile drainage.

<b>IWM 312 Irrigation and Drainage Engineering</b>	<b>Credit – 1</b>
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Determination of soil moisture using Neutron Probe and Tensiometer; Development of soil moisture characteristic curves; Determination of irrigation water requirement; Measurement of evapotranspiration; Design of irrigation canals and drainage ditches; Demonstration of various irrigation methods and subsurface drainage systems; Determination of irrigation water quality; Determination of physico-chemical properties of saline and alkaline soils; Preparation of soil saturation extract and determination of pH and electrical conductivity; Study tour to irrigation projects and report writing.

<b>IWM 313 Groundwater Engineering</b>	<b>Credit – 2</b>
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Historical background and importance of groundwater; Origin and occurrence of groundwater; Aquifer and their properties; Groundwater Exploration: Surface investigation of groundwater; Remote sensing and geophysical techniques; Sub-surface investigation of groundwater; Groundwater Movement: Groundwater flow equations; Flow net analysis; Well hydraulics: Flow towards confined and unconfined wells; Pumping tests for analyzing drawdown & yield; Well interference and spacing; Aquifer recharge and yield; Groundwater quality & pollution.

<b>IWM 314 Groundwater Engineering</b>	<b>Credit-1</b>
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Determination of hydraulic conductivity, storage coefficient, specific yield and transmissibility of aquifers from field data; Water level depth measurement in tube well and aquifers; Preparation of groundwater table hydrograph, contour map and flow-nets for selected locations; Collection and analysis of formation materials and plotting grain-size distribution curves; Problems on groundwater flow and well hydraulics; Determination of aquifer properties from pump test data; Assessment of groundwater recharge and case studies on groundwater balance of aquifer; Assessment of groundwater quality through field kits; Field visits.

<b>FS 311 Soil Mechanics</b>	<b>Credit-2</b>
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Introduction: Soil: Engineering definition, constituents, particle size distributions; Soil Classification and Phases: physical & mechanical properties on volumetric and gravimetric relations. Soil Consistency, plasticity limits & determination. Compaction: Proctor & modified Proctor tests, effect of compaction on soil properties. Stabilization: uses & methods. Consolidation: primary & secondary consolidation. Shear Strength: Cubical stress systems, stress equilibrium, Mohr-Coulomb equation for two & three-dimensional cases. Direct shear & triaxial tests.

<b>FS 312 Soil Mechanics</b>	<b>Credit-1</b>
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Soil identification and classification. Particle size analysis. Determination of soil moisture, bulk density, particle density and specific gravity. Determination of void ratio, porosity and degree of saturation. Determination of Atterberg limits – shrinkage, plastic and liquid limits. Proctor and modified proctor tests for maximum density and optimum water content. Consolidation test. Soil penetration test by Pocket Penetrometer. Direct shear test for cohesion and shearing angle of soils.

<b>FS 313 Concrete Structure Design</b>	<b>Credit-3</b>
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Plain concrete: Definition, concrete mixing and placing, curing, general properties, stress-strain relationship. Reinforced concrete: shear and bond analysis, working stress and ultimate strength design methods. Prestressed concrete: prestressing systems, Slab: Beams: Flexural design by working stress and ultimate strength, Design for shear, diagonal tension and bond, design details. Lintel: Column: design of tied, spiral and long columns. Footing: design of wall, spread, combined and pile footing. Retaining wall: Type, design of different components of retaining wall. Stairs: Type, design of stairs and landing.

<b>FS 314 Concrete Structure Design</b>	<b>Credit-1</b>
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Abrasion test for shingle, boulder and pea-gravel. Design of concrete mixes. Compressive and Tensile strength of

concrete. Design, casting and testing of reinforced concrete beam for flexural strength. Design of reinforced concrete column. Design of bridge slab.

<b>FPM 321 Agricultural Machinery</b>	<b>Credit-3</b>
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Machine Performance, Mechanics of tillage, Hitch Systems, load transfer and balancing, Soil Tillage; Primary and Secondary Tillage Implements; Crop Planting, , precision planting; potato planters, Intercultural equipment, Fertilizer application, Spraying and Dusting, Hydraulic sprayers. Granular pesticide applicators, Crop Harvesting: reapers; their operation, performance and maintenance; functional component of a combine, calibration of a combine; Corn combines Potato harvester, and fruit harvesting, threshing of grains: functional components of threshers, their construction, performance and maintenance.

<b>FPM 322 Agricultural Machinery</b>	<b>Credit-1</b>
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Study of primary and secondary tillage implements, Hitching of tillage implements and machines, Field operation of primary and secondary tillage implements, Measurement of draft, specific draft, drawbar powers, slips and field capacity of primary and secondary tillage implements, Study of seed drills, fertilizer distributor, sprayers, reapers, combine harvester and threshers, Calibration of seed drills, fertilizer distributor, and sprayer, Field operation of reaper and combine harvester, Determination of capacity, losses and material efficiency of a thresher.

<b>FPM 323 Rural Electrification Engineering</b>	<b>Credit-2</b>
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Rural electrification ,Supply systems: Transmission and distribution systems.: Overhead and cable systems. Kelvin's Law, Mechanical design of overhead lines: Overhead insulators: Types of insulators, Eletrical design of overhead lines:, Farmstead distribution system: Load centers, service entrance switch, wire sizes, earthing methods, Voltage control: Symmetrical components: Unsymmetrical faults. Circuit breakers: Protective relaying: Over current relays, directional relays, impedance relays and differential relays, Protection of lines and transformers: Oil circuit reclosure & lighting arrester.

<b>FPM 324 Rural Electrification Engineering</b>	<b>Credit-1</b>
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Electric wiring practices: Wiring code, procedures and safety rules, Design of outlets, branch circuits and service entrance switch for residences, farms, office and factory buildings, Locating load center and finding wire sizes for feeder lines, Design of rural distribution systems, Electrical design of overhead lines, Mechanical design of overhead lines, Study of circuit breakers, Study of automatic circuit reclosure, Study of lighting arresters, A field visit to a PDB substation and a report on field trip, A study tour to REB substation and electrified farms.

<b>FS 321 Environmental Engineering</b>	<b>Credit-2</b>
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Introduction: Environment-its components, importance of environmental engineering. The spheres: Atmosphere - hydrosphere - the hydrologic cycle; lithosphere. Water supply & quality management: treatment, distribution, water quality-criteria, standard, waste water, its microbiology. Pollution & control: Air, soil, water & noise pollution. Special problems of concern: Green house effect, ozone layer depletion, photochemical smog, acid rain, radioactive pollution, arsenic pollution. Environmental laws & legislation: International and Bangladesh laws and their enforcement.

<b>FS 322 Environmental Engineering</b>	<b>Credit-1</b>
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Air sample test: SO<sub>x</sub>, NO<sub>x</sub>, CO, particulate matter. Physical, chemical & bacteriological tests of water & waste water. Determination of pesticide residue. Measurement of intensity of noise.

<b>Ag.Ext 321 Agricultural Extension Education</b>	<b>Credit-2</b>
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Meaning, Philosophy and principles of agricultural extension, need for extension work, tools, farm machinery, irrigation, food technology and farm housing. Personnel for extension work: administrators, supervisors, specialists and field extension workers; qualifications and responsibilities; Learning process: Laws of learning and their implications in extension work Communication in extension; extension teaching methods; classification of extension teaching methods. Technology transfer in agriculture: diffusion of innovation, factors affecting the diffusion of innovation, innovation-decision process and adopter categories. Programme planning process: Meaning of programme planning, principles and procedures of programme planning. Methods of problem identification in extension: PRA, PRA, FINA, ICAP Servey. Environment and sustainability issues of agricultural development: Impact of modern agriculture on environment.

<b>Ag.Ext 322 Agricultural Extension Education</b>	<b>Credit- 1</b>
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Methods of data collection and preparation of interview schedule related to agricultural engineering works. Preparation of plan of work and calendar of work. Preparation of selected teaching materials such as poster, leaflet, flashcards and then presentation through lecture. Field trip in rural areas with farmers in order to be acquainted with the on-going and development activities at Upazela/Block/Village levels. Identification of problems and prospects of agricultural engineering works. Students would be required to visit different on going activities of GOs and NGOs, observe the existing equipment/machinery that are being used at different stages of farming including post harvest operations and submit a report at the end of the trip.

<b>CSM 321 Algorithm</b>	<b>Credit - 2</b>
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Concept of software engineering: problem solving aspect, top-down design, implementation of algorithms, proof of correct programming, efficiency of algorithm, time complexity analysis; queue and its sequential representation: inserting & deleting nodes from a list, circular list, doubly linked list, list implementation, list algorithm for stack and queues; dynamic memory allocation; binary tree search, insertion, deletion, breadth-first, depth-first traversals; searching and sorting: binary & linear search, bubble sort and quick sort; recursion: recursive definition and processes, recursion in C, writing recursive functions; file representation: sequential & random, accessing file algorithm for searching and sorting file.

<b>CSM 323 Engineering Mathematics</b>	<b>Credit - 2</b>
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Numerical Methods: Taylor, Newton-Raphson Method, Gauss Sidel and Range-Kutta complex variables: complex variable functions, Cauchy-Reimann differential techniques, analytical function, mapping characteristics, bi-linear transformation, complex integration. Vector calculus: scalar and vector field; gradient and divergence; line, surface and volume integration; integration in coordinate system (Cartesian, polar, cylinder and sphere); Jacobian transformation; Poisson and Laplace transformation; partial differential equations: differential equation phenomena in science and engineering; wave and thermal equation; Laplace equation solution in polar co-ordinate, cylinder and sphere; variables separation; finite differential approximation.

<b>CSM 325 Internet Programming</b>	<b>Credit - 2</b>
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HTML: tools and resources; HTML document, linking, style and publishing; image, table, forms, frames, creation; multimedia development, HTML document life cycle and coherent web site. SGML and XML: data, documents and logical/physical structures; structuring XML, documents types; declaration DTD development, XML parsers and API. Java: java basics, network, classes and security; applets and application, images and animation; I/O and JDBC; java API and beans; OOP in java and networking. Java scripting: using built-in objects; creating custom objects; responding to events; creating browser specific scripts. CGI programming: Perl language, interpreter, packages, modules and objects.

<b>FPM 325 Heat and Mass Transfer</b>	<b>Credit – 2</b>
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Modes of heat transfer, Fourier law, Newton's law, steady state heat conduction in plane slabs, cylindrical layers and spherical layers. Two dimensional steady state conduction-numerical method of analysis and electrical analogy. Transient heat conduction. Transient numerical method. Principles of convection -boundary layer principles, Reynolds analogy and dimensional analysis. Natural convection, Heat Exchangers: Fouling and scaling of heat exchanger, Radiation exchange between black surfaces. Grey-body radiation exchanges and solar radiation. Mass Transfer: Fick's law of diffusion, mass transfer by molecular diffusion and convection, simultaneous heat and mass transfer phenomena, Empirical equations.

<b>FPM 327 Refrigeration and Air Conditioning Engineering</b>	<b>Credit – 2</b>
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Applications of Refrigeration and Air Conditioning: psychrometric processes Advanced Psychrometry, Refrigeration, Reversed carnot cycle; Gas cycle refrigeration; simple vapour-compression refrigeration; absorption refrigeration; properties of refrigerants; Equipments– multi-stage compression; cascade system; heat pumps, Cooling and Heating Load Estimation, Factors affecting human comfort; building survey and heat load estimation; Air conditioning Systems and Applications, Controls, Acoustics and Noise Control, Study of sound and acoustics; room characteristics; acoustic design in buildings, Cold Storage and Preservation Chambers.

<b>FPM 328 Refrigeration and Air Conditioning Engineering</b>	<b>Credit-1</b>
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Practice on problem solving on heat transfer psychrometry; refrigeration building survey; occupancy, storage and heat load estimation; equipment selection and control measures, Visit to cold storage and food process industry.

<b>FS 323 Solid Waste Management</b>	<b>Credit-2</b>
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Introduction, sources, generation & types of solid wastes. Waste properties & composition: composition of wastes. Effects of solid wastes: Stages of management: Collection, on-site handling, storage & processing, transfer stations & transport, ultimate disposal, land filling, hazardous wastes-types, treatment,. Waste recovery, recycling & reuse, bio-gas - generation, factors, mechanism, types of digester, digester design, biofertilizer- mechanism, potential, applicability, composting- factors, controlling points, plant design.

<b>FS 324 Solid Waste Management</b>	<b>Credit-1</b>
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Design of bio-gas generation plant. Processing of food & fuel from waste. Composting & incineration of solid wastes. Sanitary land fills, problems, solutions. Visit to waste treatment plants.

<b>IWM 323 Agricultural Meteorology</b>	<b>Credit – 2</b>
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Agricultural meteorology, Climates and Weather:, Solar and Earth Radiation: structure of the atmosphere, Nature and laws of electromagnetic radiation, Heat balance of earth's surface and atmosphere, Thermal circulation, Jet streams, Clouds, Thunderstorms and Tornadoes: Clouds and air motions, Convective clouds,: Temperature, Lapse rate; Precipitation- formation, forms, types & measurements; Artificially induced precipitation; Wind speed profile, Wind breaks and shelter effects, Effect of Climatic Elements on Agriculture: Photosynthesis, Photoperiodism, Thermoperiodism, Vernalization, Soil moisture, Soil temperature, Evapotranspiration, Wind effect, Crop climate, Climatic Change and Crop Production: Causes of weather and climatic change, ecosystem, Impact of climate changes on crop production, Greenhouse effect and its consequences.

<b>IWM 321 Hydraulic Engineering</b>	<b>Credit – 2</b>
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Open Channels: Classification, uses and geometric elements of open channel, Open Channel Flow: Types, state and regimes of flow. Energy and Momentum Principle in open channel flow, Critical state of flow, Section factor and hydraulic exponent, Computation of critical flow, Control of flow. Uniform Flow: Chezy's and Manning's formula, Determination of roughness coefficient, Conveyance of a Channel section, Section factor and hydraulic exponent of uniform flow computation, Design of channel for uniform flow. Gradually Varied Flow: Computation of water surface profile. Rapidly varied Flow: Hydraulic jump and Flow over spillways.

<b>IWM 322 Hydraulic Engineering</b>	<b>Credit – 1</b>
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Study of hydraulically operated gates, Determination of Manning's roughness coefficient, Study of velocity distribution in an open channel, Determination of energy and momentum correction factor, Design of open channels, Study of flow over a hump, Calibration of a broad crested weir, Study of hydraulic jump, Study of free overfall phenomenon, Determination of end depth, Computation of flow profiles, Computation of critical flow, Computation of gradually varied flow.

<b>IWM 323 Agricultural Meteorology</b>	<b>Credit – 2</b>
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Agricultural meteorology, Climates and Weather:, Solar and Earth Radiation: structure of the atmosphere, Nature and laws of electromagnetic radiation, Heat balance of earth's surface and atmosphere, Thermal circulation, Jet streams, Clouds, Thunderstorms and Tornadoes: Clouds and air motions, Convective clouds,: Temperature, Lapse rate; Precipitation- formation, forms, types & measurements; Artificially induced precipitation; Wind speed profile, Wind breaks and shelter effects, Effect of Climatic Elements on Agriculture: Photosynthesis, Photoperiodism, Thermoperiodism, Vernalization, Soil moisture, Soil temperature, Evapotranspiration, Wind effect, Crop climate, Climatic Change and Crop Production: Causes of weather and climatic change, ecosystem, Impact of climate changes on crop production, Greenhouse effect and its consequences.

<b>FPM 401 Agricultural Mechanization</b>	<b>Credit – 2</b>
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Myths of mechanization, meaningful mechanization; stages of mechanization; factors influencing mechanization. Different cost parameters; break-even analysis, Depreciation, determination of annual cost. Farm size and selection of machinery. Machine performance; machinery selection; power selection and machine replacement; systems approach to farm mechanization, management and training. Planning of operation: Classification of field work; Multipurpose use of machinery, timeliness of operation, mechanization and poverty alleviation, mechanization and national economy.



<b>IWM 401 Pumps and Wells</b>	<b>Credit – 2</b>
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Pumps and Pumping Plants; Pump classification, selection and characteristics; Matching of pumps and pipelines; design and economy, Power requirements, efficiency; Pump installation, fittings and electrical connections; Operation, maintenance and trouble shooting, Deep Well Pumps: Principles of operation; Pump selection and installation; Pump troubles, remedies and maintenance, Water Wells: Types, Design and Construction, Types of tubewells, Radial wells and Infiltration galleries; Tubewell interference and spacing, Construction of bored and driven wells, Tubewell drilling methods, Installation of tubewell accessories, Pump and prime movers, Development and Testing of Tubewells: Testing of well yield and well performance, Causes of tubewell failure and trouble shooting, Evaluation of well performance for diagnosing causes of failure; Corrosion and Incrustation of well screens; Rehabilitation of sick wells.

<b>IWM 402 Pumps and Wells</b>	<b>Credit – 1</b>
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Study of various types of manually operated pumps used in Bangladesh and report writing, Study of various suction mode and force mode pumps used for groundwater abstraction in Bangladesh and report writing, Determination of efficiencies of different pumping devices, Preparation of a typical layout of an irrigation pump installation, Determination of power requirements of different types of centrifugal pumps and their cost estimates, Collection of test- boring data from a site and their analysis for preparation of grain size distribution curves and well logs, Field performance test of a Tubewell to evaluate specific capacity, efficiency and verticality, Field visit to a deep tubewell drilling site and preparation of a detail report on it, Economic feasibility study for an existing tubewell project.

<b>IWM 403 Soil and Water Conservation Engg.</b>	<b>Credit – 3</b>
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Factors affecting infiltration, Rainfall simulator, runoff, Prediction of runoff rates and volumes, Forms of erosion, Water erosion: Estimation of soil losses, Erosion control measures, Wind Erosion: Wind profile, Erosiveness, Vegetated Outlets and Water Courses: Uses and design, Waterway construction and maintenance, Terracing: Design of terraces, Construction and maintenance of terrace, Conservation Structures: Drop spillways, Chutes, Formless flumes, Pipe spillways, Culverts, Drop inlets, Hood inlets and outlet protection, Legal Aspects of Soil and Water Conservation: Kinds of Law, Contracts, Assessment, Zoning and weather modification, Legal aspects with respect to irrigation and drainage.

<b>IWM 404 Soil and Water Conservation Engg.</b>	<b>Credit – 1</b>
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Measurement of infiltration and estimation of infiltration indices, Determination of soil loss by simulated rainfall in laboratory, Determination of soil loss by flowing water in a field, Determination of soil loss by Universal Soil Loss Equation (USLE), Design and construction of vegetated outlets, Planning and design of terrace system, Design of conservation structures - drop spillway, chute, flumes, pipe spillway, Field trip and report writing.

<b>CSM 402 Computer Aided Design</b>	<b>Credit - 1</b>
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Basics of AutoCAD; drawing lines, circle, arcs, ellipses, polygons, filled objects and Solids; changing view of the drawing; creating and deleting views; managing drawing layers; precision drafting tools; editing drawing; multi-view drawing layout, plotting and plot style; 3D drafting; file management and data exchange.

<b>CSM 403 Database Management System</b>	<b>Credit - 2</b>
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File and database management system (DBMS); disk storage management; record format; file management. index methodology; index characteristics and structure; insert, update delete operation; Relational model: table, relational algebra, SQL: PL/SQL basics; SELECT command; special domain in ORACLE, UNION, INSERT and EXCEPT; aggregate query; query by examples(QBE); building select query using QBE; using advanced queries; changing contents of table using action; queries. Query processing: database work load; guideline to choice of index, coordinating index screening, 2-phase tight locking; database security.

<b>CSM 405 Electronics and Instrumentation</b>	<b>Credit - 2</b>
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Semiconductor diode operation and characteristics; transistor operation, it's application, characteristics and equivalent circuit; self-biasing circuit; amplifiers; timer circuits; DC motor speed control circuit; applications of measurement instruments; generalized configuration and functional descriptions of measuring instruments; performance characteristics of instruments; static and dynamic characteristics; measuring devices; measurement of voltage, current, power, energy, flux and light; AVO meter; Oscilloscope; transducers; strain, temperature and pressure measurement ; accuracy and error measurement.

<b>FPM 403 Agricultural Process Engineering</b>	<b>Credit – 2</b>
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Post-harvest processing and preservation of agricultural crops; its importance in Bangladesh. *Drying*: Importance of drying; sun-drying and mechanical drying; principles of drying; factors that affect drying. *Drying systems*: Solar and mechanical drying systems of agricultural products; Introduction to thin layer, deep bed and continuous flow drying of agricultural products. *Moisture content*: Moisture content representation and methods of moisture determination. Static and Dynamic EMC, models of EMC, methods of determination of EMC. *Cleaning, Sorting and Grading*: Cleaning sorting, and grading of agricultural products, aerodynamics of small particles, different types of separators. *Parboiling*: Principles of parboiling of rice and methods of parboiling of paddy. *Milling*: Rice milling and milling of wheat, corn and pulses. *Storage*: Principles of storage, traditional and modern storage systems of agricultural products.

<b>FPM 404 Agricultural Process Engineering</b>	<b>Credit – 1</b>
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Determination of moisture content of cereal crops. Determination of pressure drops in grain bins, practice on set-up of indicating, recording and process control instrumentation, study of dryer and drying process. Experiments on milling, mixing, separation of solids and conveying. Study of rice mill and milling process.

<b>CSM 410 Project Work and Seminar</b>	<b>Credit - 1</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>CSM 407 Multimedia Systems</b>	<b>Credit - 1</b>
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Introduction to multimedia: multimedia definition, multimedia work station components, distributed multimedia architecture, multimedia application briefing; multimedia compression techniques: storage requirement for multimedia application, compression techniques classification, JPEG compression standard, H.261 standard, compression application and implementation; multimedia storage and restore: audio/video digitizing characteristics, block storage budget techniques for multimedia data, combination techniques, square techniques; multimedia on-demand service: interactive TV, multimedia server – component and functions, interactive TV integration, multimedia services; multimedia equipment, application and system.

<b>CSM 409 Discrete Mathematics</b>	<b>Credit - 2</b>
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Logic, sets and functions: algorithms, integer and matrices; method of proof, mathematical induction, recursive definitions and algorithms; program correctness; basics of counting; graphs; generalized permutations and combinations; advanced counting techniques; tree traversal; trees and sorting.

<b>CSM 411 Engineers and Society</b>	<b>Credit - 2</b>
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Engineering profession, public image, engineers in public sector, private sector, code of Ethics role of engineers in society, engineers acts; environmental issues, air and water, green house effect, power and nuclear energy, health and safety in work place; legal system, civil law procedure, criminal law procedure; contract definition essential of a contract, termination of contract, breach of contract, strategy before signing a contract; engineers as manager, corporate practice, decision making; requirements to become an entrepreneur, to start a business, types of business, business law.

<b>CM 401 Accountancy</b>	<b>Credit - 2</b>
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Fundamental concepts of Accountancy: Debit (Dr), Credit (Cr), Transaction, Business Transaction, Leger Posting, Accounting concepts and conversions. Double entry system of Accounting and Accounting Cycle: Accounts and its classifications. Cash Book, Classification of Assets and Liabilities, Financial Accounts with adjustments. Single Proprietorship business, Bill of Exchange. Application of accounting principles to food processing firms.

<b>FPM 413 Precision Agriculture</b>	<b>Credit – 2</b>
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Management of information systems, global position systems, geographical information systems, meteorological information, mapping technology, advanced agricultural technology, precision control systems: Management zone concepts, Standardization; database creation: Crop characteristics, Plant growth response to inputs, Application of

advanced technologies to agriculture: GIS, GPS and Remote Sensing applications, Instruments, sensors and control technology: Sensors- Calibration and use in farm activities; Site specific management techniques: Variable Rate Technology (VRT), Mapping of information on soil, crop yield and profit, On-farm Research, Setting up on-farm experiments, Decision support systems: Interpretation of the available information, Appropriate decisions making related to agricultural production systems.

<b>FPM 414 Precision Agriculture</b>	<b>Credit – 1</b>
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Based on the theory course

<b>CSM 413 Microprocessor Systems</b>	<b>Credit - 2</b>
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Types of computers; microcomputer general architecture; 8088/8086 microprocessor architecture; 8088/ 8086 software architecture; memory address space and data organization; data type; special storage and multipurpose memory; instruction pointer; data register: pointer, index and status; memory address generation; stacks; I/O address space machine code instruction set and addressing mode; microprocessor programming for 8088 /8086; memory and I/O interfacing; interrupt: mechanism, type and priorities, vector table, interrupt interfacing. 16 hour lab work: assembly language programming and debugging using computer and microprocessor development kit.

<b>CSM 415 Electronic devices and Circuits</b>	<b>Credit - 2</b>
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Semiconductors: conduction and drift velocity; holes and p-n junctions; diffusion process; contact potential; semiconductor diode: ideal diode; semiconductor material; energy level; extrinsic material; resistance level and equivalent circuits; p-n junction diodes: forward and reverse biasing p-n junction; rectification; diode circuits (gates, clipping and clamping); diode capacitance and switching. BJT's: theory of transistor; transistor capacitance and equivalent circuit. transistor biasing; single-stage CB,CE amplifier circuits; gain, input & output impedance; emitter follower; class A power amplifier; FET's: JFET action; JFET biasing, equivalent circuit and amplifier; MOSFET action, gate circuits; multi-stage amplifier.

<b>FPM 403 Agricultural Process Engineering</b>	<b>Credit – 2</b>
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Post-harvest processing and preservation of agricultural crops; its importance in Bangladesh. *Drying*: Importance of drying; sun-drying and mechanical drying; principles of drying; factors that affect drying. *Drying systems*: Solar and mechanical drying systems of agricultural products; Introduction to thin layer, deep bed and continuous flow drying of agricultural products. *Moisture content*: Moisture content representation and methods of moisture determination. Static and Dynamic EMC, models of EMC, methods of determination of EMC. *Cleaning, Sorting and Grading*: Cleaning sorting, and grading of agricultural products, aerodynamics of small particles, different types of separators. *Parboiling*: Principles of parboiling of rice and methods of parboiling of paddy. *Milling*: Rice milling and milling of wheat, corn and pulses. *Storage*: Principles of storage, traditional and modern storage systems of agricultural products.

Post-harvest Processing and preservation of agricultural crops. Drying, sun-drying and mechanical drying, methods of drying grain, moisture determination., Static EMC and dynamic EMC, commonly used models of EMC, methods of determination of EMC. Thin-layer drying model, deep bed drying and deep bed drying models. Logarithmic models of bulk deep bed drying (Hukill analysis). Size reduction– Fineness modulus and uniformity index, sieving analysis, burr mill, hammer mill and crushers. Cleaning, Sorting and Grading- Cleaning sorting, and grading of agricultural products, Materials handling- Transportation and conveyors.

<b>FPM 404 Agricultural Process Engineering</b>	<b>Credit – 1</b>
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Determination of moisture content of cereal crops. Determination of pressure drops in grain bins, practice on set-up of indicating, recording and process control instrumentation, study of dryer and drying process. Experiments on milling, mixing, separation of solids and conveying. Study of rice mill and milling process.

<b>FPM 405 Machine Design</b>	<b>Credit – 2</b>
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Philosophy of Design. Design review and reliability engineering. Materials for machine elements: Properties and tests. Design of machine members under simple; combined stresses and variable loads including stress concentration. Flexible drives: Flat & V-belts, Wire ropes, Roller chain, Universal joints. Design of Journal bearings and selection of proper lubricants for them. Selection of ball & roller bearing. Design of spur gear, helical gear, bevel gear.

<b>FPM 410 Project Work and Seminar</b>	<b>Credit – 1</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>CSM 405 Electronics and Instrumentation</b>	<b>Credit - 2</b>
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Semiconductor diode operation and characteristics; transistor operation, it's application, characteristics and equivalent circuit; self-biasing circuit; amplifiers; timer circuits; DC motor speed control circuit; applications of measurement instruments; generalized configuration and functional descriptions of measuring instruments; performance characteristics of instruments; static and dynamic characteristics; measuring devices; measurement of voltage, current, power, energy, flux and light; AVO meter; Oscilloscope; transducers; strain, temperature and pressure measurement ; accuracy and error measurement.

<b>CSM 406 Electronics and Instrumentation</b>	<b>Credit - 1</b>
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Practical laboratory use based on theory (CSM 405) class and terminal use.

<b>FPM 407 Manufacturing Methods &amp; Quality Control</b>	<b>Credit – 2</b>
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Economical production criteria; Product design; Selection of materials, machines and processes; Nature and Properties of materials: Material Classification; Properties of materials. Heat treatment of metals: Iron-Iron carbide diagram; Annealing, hardening, tempering and normalizing processes. Special Metal Working Process: Special machining process;; Electroforming; Metal spraying, Metallic coatings. Work Study: Time and motion study, work sampling. Inspection and total quality control, Statistical quality control, Value Engineering and Analysis, Production Planning and control, Introduction to reliability engineering.

<b>FPM 408 Manufacturing Methods &amp; Quality Control</b>	<b>Credit-1</b>
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Solution of problems on economic product and process selection; Materials testing; Practice on special metal working processes; Safety and maintenance scheduling, Visit to manufacturing and metal working industries.

<b>CM 417 Agribusiness and Marketing</b>	<b>Credit-2</b>
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Agribusiness : definition, scope and importance. Agribusiness system and goals of agribusiness firm. Managing the agribusiness: Business location, business facilities, production, services or sales activities. Marketing concepts and development of marketing plan. Analysis of market. Marketing mix decisions: The product, the price, the place & the promotion. Food processing and manufacturing industries in Bangladesh & their marketing problems.

<b>FPM 411 Soil Dynamics and Tillage</b>	<b>Credit – 2</b>
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Dynamic properties of Soil. Effect of tillage operation on soil physical condition; upland and lowland farming condition. Traction mechanics, Traction prediction from dimension analysis; Tire, Load and air pressure analysis. Mechanics of the form Tractors, Equations of motion; equilibrium analysis, force analysis, Longitudinal stability, Lateral stability, determination of centre of gravity and moment of inertia; dimensional analysis, dynamic principles and design guidelines, balancing conditions.

<b>FPM 412 Soil Dynamics and Tillage</b>	<b>Credit – 1</b>
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Based on the theory course.

<b>FPM 413 Precision Agriculture</b>	<b>Credit – 2</b>
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Management of information systems, global position systems, geographical information systems, meteorological information, mapping technology, advanced agricultural technology, precision control systems: Management zone concepts, Standardization; database creation: Crop characteristics, Plant growth response to inputs, Application of advanced technologies to agriculture: GIS, GPS and Remote Sensing applications, Instruments, sensors and control technology: Sensors- Calibration and use in farm activities; Site specific management techniques: Variable Rate Technology (VRT), Mapping of information on soil, crop yield and profit, On-farm Research, Setting up on-farm experiments, Decision support systems: Interpretation of the available information, Appropriate decisions making related to agricultural production systems.

<b>FPM 414 Precision Agriculture</b>	<b>Credit – 1</b>
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Based on the theory course

<b>CM 401 Accountancy</b>	<b>Credit - 2</b>
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Fundamental concepts of Accountancy: Debit (Dr), Credit (Cr), Transaction, Business Transaction, Leger Posting, Accounting concepts and conversions. Double entry system of Accounting and Accounting Cycle: Accounts and its classifications. Cash Book, Classification of Assets and Liabilities, Financial Accounts with adjustments. Single Proprietorship business, Bill of Exchange. Application of accounting principles to food processing firms.

<b>FS 411 Water Pollution and Treatment</b>	<b>Credit-2</b>
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Introduction: Water pollution: wastewater characteristics, effects of pollution, eutrophication Treatment & Disposal: the basis for treatment, preliminary, primary, secondary & advanced water treatment techniques- sludge treatment & disposal, wastewater reuse. Small scale purification: Dilution, sedimentation, filtration. The management of water & sanitation services: Participatory & community management, their sustainability. Arsenic pollution: Origin, effects, methods of removal.

<b>FS 412 Water Pollution and Treatment</b>	<b>Credit-1</b>
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Design of small scale purification systems. Design of waste water collection system. Design of waste water treatment systems. Visit to waste water treatment plants.

<b>FPM 403 Agricultural Process Engineering</b>	<b>Credit – 2</b>
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Post-harvest processing and preservation of agricultural crops; its importance in Bangladesh. *Drying*: Importance of drying; sun-drying and mechanical drying; principles of drying; factors that affect drying. *Drying systems*: Solar and mechanical drying systems of agricultural products; Introduction to thin layer, deep bed and continuous flow drying of agricultural products. *Moisture content*: Moisture content representation and methods of moisture determination. Static and Dynamic EMC, models of EMC, methods of determination of EMC. *Cleaning, Sorting and Grading*: Cleaning sorting, and grading of agricultural products, aerodynamics of small particles, different types of separators. *Parboiling*: Principles of parboiling of rice and methods of parboiling of paddy. *Milling*: Rice milling and milling of wheat, corn and pulses. *Storage*: Principles of storage, traditional and modern storage systems of agricultural products.

<b>FPM 404 Agricultural Process Engineering</b>	<b>Credit-1</b>
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Determination of moisture content of cereal crops. Determination of pressure drops in grain bins, practice on set-up of indicating, recording and process control instrumentation, study of dryer and drying process. Experiments on milling, mixing, separation of solids and conveying. Study of rice mill and milling process.

<b>FS 410 Project Work and Seminar</b>	<b>Credit-1</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>FS 415 Foundation Engineering</b>	<b>Credit-2</b>
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Introduction: trenches and causes of failure of foundation. Shallow Foundation: design of strip, square, rectangular, circular, spread, raft, mat, grillage, combined and eccentrically loaded foundations. Deep Foundation: Piles pile materials, constructions, pile grouping, pile equations, Cofferdams and Caissons: Types, uses, design criteria and constructions method. Well Foundation: uses and design. Machine Foundation, loading from vibration, principles of design. Pier Foundation: Shoring, Underpinning and Scaffolding

<b>FS 417 Applied Soil Mechanics</b>	<b>Credit-2</b>
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Soil failure Mohr-Coulomb failures in 2-d and 3-d states. Limit Load ; Soil Stresses: Stress equilibrium, stresses in

2-D due and 3-D loading. Critical States: Triaxial shearing, isotropic consolidation, critical-state parameter, Earth Pressures: limit equilibrium, slip-line and limit analysis methods, Soil Slopes and Stability: effective stresses, stability analysis by  $\phi$ -circle and active earth pressure. Bearing Capacity: functional expression, Prandtl, Terzaghi, and Meyerhof, force balance and upper bound limit methods. Settlements: measurement of settlements and adverse effects on structure.

<b>CM 401 Accountancy</b>	<b>Credit - 2</b>
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Fundamental concepts of Accountancy: Debit (Dr), Credit (Cr), Transaction, Business Transaction, Leger Posting, Accounting concepts and conversions. Double entry system of Accounting and Accounting Cycle: Accounts and its classifications. Cash Book, Classification of Assets and Liabilities, Financial Accounts with adjustments. Single Proprietorship business, Bill of Exchange. Application of accounting principles to food processing firms.

<b>CM 417 Agribusiness and Marketing</b>	<b>Credit- 2</b>
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Agribusiness : definition, scope and importance. Agribusiness system and goals of agribusiness firm. Managing the agribusiness: Business location, business facilities, production, services or sales activities. Marketing concepts and development of marketing plan. Analysis of market. Marketing mix decisions: The product, the price, the place & the promotion. Food processing and manufacturing industries in Bangladesh & their marketing problems.

<b>IWM 405 Hydrology</b>	<b>Credit – 3</b>
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Hydrologic cycle, Evaporation process, Forms and types of precipitation, Measurement and estimation techniques Temporal and areal variation of precipitation, Stream Flow: Measurement, Planning of stream flow network, Runoff: Components and classification, Annual runoff volumes, estimating storm runoff volumes, Hydrographs: Recession curves, Hydrograph separation, Unit hydrograph concept, Techniques of hydrological routing through reservoirs and channels, Probability Analysis: Probability distributions, Analytical and graphical methods of flood-frequency analysis, Low-flow analysis, Estimation of dependable rainfall, Reservoirs: Physical characteristics, Yield, Capacity, Sedimentation and site selection.

<b>IWM 406 Hydrology</b>	<b>Credit – 1</b>
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Computation of average precipitation over an area, Estimation of reservoir evaporation, Estimation of missing precipitation, Measurement of stream flow using current meter, Extension of rating curves, Derivation of unit hydrograph, Applications of unit hydrograph, Computation of outflow through reservoir routing, Computation of downstream flow through channel routing, Flood frequency analysis by analytical and graphical methods, Determination of reservoir capacity.

<b>IWM 407 Hydraulic Machinery</b>	<b>Credit – 2</b>
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Flow and work done over radial vane, Jet propulsion, Water Turbines: Reaction and impulse turbines, Pelton wheel, Specific speed, Characteristic curves Centrifugal Pumps: Minimum starting speed, Water pressure, Specific speed and characteristic curves, Design of a turbine pump, Cavitation and self priming, Multi-stage pump, Reciprocating Pumps: Types, Force pump, Work done by pump, Functions of air vessel, Small Hydraulic Machines: Hydraulic ram, Hydraulic accumulator, Hydraulic intensifier, Rotary piston pump, Hydraulic valves, Water meters, Jet Pump, Gear pump, Air lift pump, Differential pump, Pulsometer pump and Bucket pump.

<b>IWM 408 Hydraulic Machinery</b>	<b>Credit – 1</b>
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Demonstration and problems on water turbines, Demonstration and problems on centrifugal pumps, Determination of input and output power of a centrifugal pump at different speeds, Demonstration on reciprocating pumps, Determination of pump characteristics curve using centrifugal pump test rig, Numerical exercises, Field visit and report writing.

<b>IWM 410 Project Work and Seminar</b>	<b>Credit – 1</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>SS 403 Soil Physics</b>	<b>Credit - 2</b>
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*Physical characteristics of soil:* Soil as a disperse three phase system, Mass volume relationship of soil constituents; *Soil water:* Concepts of soil water, Factors affecting soil water retention; Methods of measuring soil water- gravimetric, tensiometer and neutron scattering method; Soil water potential- metric potential, pressure potential, gravitational potential, osmotic potential, measurement of metric potential by tensiometer; *Water movement:* Infiltration-definition, factors affecting, equations, methods of measurement; Hydraulic conductivity-definition, Darcy's law, methods of measurement, classes of hydraulic conductivity. *Soil temperature:* Importance, factor affecting and management of soil temperature; Thermal properties of soils, Heat flow equation; *Mechanical analysis:* Principle and methods; derivation of Stokes' law; Soil consistency and tillage; Forms of soil consistency, swelling, shrinkage; Tillage and puddling; Plough pan - formation, effects on soils and crops

<b>CSM 403 Database Management System</b>	<b>Credit - 2</b>
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File and database management system (DBMS); disk storage management; record format; file management. index methodology; index characteristics and structure; insert, update delete operation; Relational model: table, relational algebra, SQL: PL/SQL basics; SELECT command; special domain in ORACLE, UNION, INSERT and EXCEPT; aggregate query; query by examples (QBE); building select query using QBE; using advanced queries; changing contents of table using action; queries. Query processing: database work load; guideline to choice of index, coordinating index screening, 2-phase tight locking; database security.

<b>CM 401 Accountancy</b>	<b>Credit - 2</b>
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Fundamental concepts of Accountancy: Debit (Dr), Credit (Cr), Transaction, Business Transaction, Leger Posting, Accounting concepts and conversions. Double entry system of Accounting and Accounting Cycle: Accounts and its classifications. Cash Book, Classification of Assets and Liabilities, Financial Accounts with adjustments. Single Proprietorship business, Bill of Exchange. Application of accounting principles to food processing firms.

<b>LAN 401 Communication Skill</b>	<b>Credit - 2</b>
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*Situational English (Oral & Professional):* Selected dialogues and conversations each supplemented by socio-cultural rules necessary for effective language use. *Reading Comprehension:* Selected articles on science, Agriculture and engineering. *Writing skills:* Practicing some compositional activities essential for making written communication; e.g. Letter ( formal & informal) CV, Report writing, Précis, Summary, Paragraph, Abstract etc. *Structural Grammar:* Written: Sentence (Type and Structure), Agreement between Subject & Verb, Tense & Voice, Gerund, Participles, Infinitives, Modal auxiliaries, Conditionals, Combination of sentences. Phonetics (spoken): IPA, Pronunciation, Stress and accent, Intonation.

<b>FPM 421 Engineering Management</b>	<b>Credit - 2</b>
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Basic concepts: elements of management, organization for management; organization structure; process of delegation; responsibility and authority. SWOT analysis., pay back period, cost-benefit ratio; economic comparison between investment alternatives, Formulation of LP models; graphical solution, simplex method, duality theory and sensitivity analysis, Network analysis - maximal flow, PERT and CPM, Transportation and distribution problem, Introduction to inventory model and queuing theory, Introduction to Dynamic Programming, Purchasing; introduction to accounting procedure; Tender and quotation; signing of contract, Project Planning Cycle, PRA & PNA; Problem tree; stakeholder analysis; logical frame and activity bar chart.

<b>IWM 421 On-Farm Water Management</b>	<b>Credit - 2</b>
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Scope and problems of on-farm water management, water sources, lifting devices, power unit, distribution systems, method of irrigation, Factors affecting command area, command area development, Flow Measuring Devices and Techniques: Use of portable weirs and flumes, Water Distribution System, Irrigation system management, Crop-water production function and their uses, Diagnostic Analysis of Irrigated Farming System: Socio-cultural and Economic Aspects of On-farm Water Management: designing and constructing irrigation and drainage system, Farmer's organization, Irrigation economy and cost-benefit analysis, Need and purposes of project performance evaluation, Indicators and factors for project performance, Fundamental approaches of project performance evaluation.

<b>IWM 422 On-Farm Water Management</b>	<b>Credit - 1</b>
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Calibration of notches and weirs, Measurement of discharge from a pump/tubewell, Measurement of flow in an irrigation canal by, (a) Float method, (b) Rectangular notch, (c) V-notch, (d) Cut throat flume (e) Pitot tube, Measurement of water loss in canal by (a) Inflow-outflow method, (b) Ponding method, Diagnostic analysis of a

water conveyance system. Field visits and report writing on: Problems of on-farm water management, Performance evaluation (case study) of a small irrigation project.

<b>CSM 421 Digital Circuits</b>	<b>Credit - 2</b>
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Functional & logical gates: boolean algebra, functional logic, logic gates, truth table, DeMorgan theorem, universal gate application; integrated circuit logic family :TTL, CMOS, ECL and their characteristics such as input current & voltage , output current & voltage , load, propagation delay, noise margin & voltage source; combinational logic circuits: minimization of functional logic using boolean algebra, Karanaugh a Quine-McChuskey map; hail & adder ; parallel adder, serial adder; subtractor; comparator; serial and parallel multiplier; multiplexer, demultiplexer; coder, decoder and 7 –segment display; concepts of storage circuit, flip-flop(RS, JK, D, T) level and edge trigger; counters: up and down counter, binary counter, ripple counter, BCD number counter, synchronous and asynchronous counter, resister.

<b>CSM 423 Operations Research</b>	<b>Credit - 2</b>
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Model development fundamentals; linear programming and sensitivity analysis; integer programming, distribution problems; inventory and replacement problems; dynamic programming; queuing theory; simulation.

<b>CSM 425 Computer Network</b>	<b>Credit - 2</b>
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The needs for networked computer; fundamentals of network technology; OSI: needs for open standard and system, layered model methodology; data transmission fundamentals, digital modulation technique, DTE-DCE interfacing, error checking, timer coding synchronization technique, data coding technique; data link layer: data link control protocol; idle and continuous RQ; go back protocol and selective repeat; timer, windows, piggy back acknowledgement concept; PSDN: diagram, virtual circuit, X.25 protocol, routing, traffic control; LAN: topology, carrier sense multiple access, token ring, protocols comparisons; network connection: STP and bridging protocol, intra domain routing, gateway, addressing and subnet masking. Internet application: FTP, TELNET, E-mail, HTTP.

<b>CSM 430 Project Work and Report</b>	<b>Credit - 3</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>CSM 427 Computer System Administration</b>	<b>Credit - 2</b>
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The system administrator's job requirements, service-level specifications, initial and ongoing requirement analysis, implicit requirement, operational analysis, decisions and recommendations; file system, system documentation, risk assessment, access costs, plan recovery strategies, monitoring, diagnosis, solutions and over engineering; performance monitoring tools, managing CPU resources, managing memory use, optimizing disk I/O performance, network performance, helpdesk and troubleshooting, system report, improvement planning; data integrity, ensuring availability, confidentiality, enforcement, security system; kernel basics, virtual memory, process scheduler, compilation and installing the kernel; file and hardware support; shell's common utilities, scripting, log file filtering and aging, security; UNIX and Windows system administration; managing NTFS file system, server, user accounts, managing process, network configuration, backups, print service.

<b>CSM 429 Operating Systems</b>	<b>Credit - 2</b>
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Operating System (OS) overview, history of OS developments, OS services, layered design issues-systems calls and program; process concept, threads, CPU scheduling algorithms, process synchronization, critical section, semaphores, deadlock's; memory management: logical and physical addresses, contiguous memory allocation, paging and segmentation, virtual memory, page replacement algorithms; file management: file concept and access, directory structures, file allocation- continuous, linked, indexed, free space management, disk scheduling methods, protection domains and access matrix, capability based systems, overview of security issues, case study of an OS (UNIX or any other), distributed systems: network concept, remote services, naming and transparency, state less and state full services, file replication, coordination issues in distributed systems.

<b>FPM 429 Project Planning &amp; Evaluation</b>	<b>Credit - 3</b>
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Project Identification and Formulation: Project Definition; Project Cycle; Participatory Planning; Stakeholder Analysis; Problem Tree and Project Formulation. Project Design Tools: Logical Framework, GANTT Chart;



Planning case study; Implementation Planning: Project Specifications, Work Breakdown Schedules; Organizational Responsibility; Performance Plans and Time Schedules, Budget Planning; Project Control; Management Information Systems; Project Monitoring; Project Evaluation; Inspection and Audit Documentation and Reporting; Writing Project Reports; Presentation Skill and Communication; Project Appraisal: Feasibility Factors; Gender Issues; Financial Sustainability; Environmental Appraisal; Sustainable livelihood Framework.

<b>CSM 433 Network Management</b>	<b>Credit - 2</b>
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Network administrator's job requirements, service-level specifications, initial and ongoing requirement analysis, implicit requirement, operational analysis, decisions and recommendations. Risk assessment, access costs, recovery strategies, monitoring, diagnosis, solutions and over engineering; performance monitoring tools, managing CPU resources, managing memory use, optimizing disk I/O and network performance, helpdesk and, system report, improvement planning; data integrity, ensuring availability, confidentiality, enforcement, security system; network, installing a network, real time monitoring the network access, resources, resource sharing such as file, printer etc.; authentication of network access and grant or deny access to the network, TCP/IP protocol, trouble shooting UNIX and Windows system administration. Managing NTFS file system, server, user accounts, managing process, network configuration, backups, print service.

<b>CSM 435 Computer Graphics</b>	<b>Credit - 2</b>
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Introduction to computer image synthesis and interactive computer graphics applications; computer graphics hardware; color image display; event driven programming; line drawing; polygon scan conversion; texture mapping; image morphing; image compositing; curves and surfaces; hidden surface algorithm; local illumination models; ray tracing and photorealistic image synthesis.

<b>CSM 437 GIS and ICT</b>	<b>Credit - 2</b>
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What and why GIS, applications and components of GIS, basic map concept, storing geographic data; graphic and tabular data integration; digitized map features, hardware and software requirements for GIS database design; digitizing errors, topology, working and manipulating attributes and data transfer; GPS; different methods of data collection (Single Point Processing); Differential and Real Time kinematics; method and post processing of GPS data; Integration of GPS with GIS; basics of ARC/INFO and Arc View; information processing and IT; OOP concept and java; application and applets; class, objects and class members; data types; control structures; array and string; access control; inheritance; static and final members; abstract, inner and adapter class; i/o stream; package, interface; applets development; graphical user interface; event handling.

<b>CSM 438 GIS and ICT</b>	<b>Credit - 1</b>
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Practical use based on theory class (CSM 437) and terminal use.

<b>FPM 423 Bio-Materials and Systems</b>	<b>Credit-3</b>
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Grain Structure, composition and properties, Thermo physical properties of grain, Physical properties of Agricultural materials, Geometric properties Kernel density and Bulk Density Thermal Properties of bulk grain, Hygroscopic Properties, Breakage resistance, Electrical properties, Optical properties;, Water storage in agricultural materials, rheology, Contact stress, Impact loading, Mechanical damage, Aerodynamic and hydrodynamic properties and phenomena, Friction problems, Wavering and pressing of agricultural materials, Cutting of agricultural materials, Grinding (comminution) of agricultural materials. Introduction of biosystems engineering, Energy in biological systems, Fluid power system, Biological waste management systems, Design of machine systems, System optimization

<b>FPM 425 Agricultural Machinery Design</b>	<b>Credit - 2</b>
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Basic Consideration of Designing Agricultural Machinery, Linkage on Farm Machinery: Common linkage types, linkages applicable to Agril. and other off road equipments, Design of tillage tools. Types and determination of forces acting on a tillage tool, Design of seeding and planning machineries, Design of Harvesting machinery, Design of Winnowing and thresher, Design review and standers.

<b>FPM 427 Testing and Standardization of Agril. Machinery</b>	<b>Credit- 2</b>
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*Operation:* Operations of Tractor, power tiller, reaper, combine harvester and thresher, *Maintenance:* Valve mechanism services, servicing of fuel system, lubrication system, cooling system, care of inlet and exhaust system, assemble and reinstallation of clutch system, and tyre services and maintenance. Maintenance of plough,

harrow, grain drill, sprayers, harvester, thresher and centrifugal pump. Testing: Test of Tractor and Power tillers; power test, field test, safety test, ergonomics and environmental test. Test procedures of hand tools, seeder, plough, harrow, seeder, sprayer, harvester and sprayers, Keeping maintenance records.

<b>FPM 428 Testing and Standardization of Agril. Machinery</b>	<b>Credit –1</b>
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Measure Revolution with tachometer (Mechanical/optical), Measure temperature with thermocouple, Measure force with transducer /strain gauge, Measurement of power/draft, Maintenance of fuel pump, filters, Injector pressure testing, cleaning injector and spark plug, Testing of oil quality, Cleaning of cooling system, Measurement of engine noise, Analysis of exhaust gas, Testing of a power tiller, Pump testing, Power tiller engine overhauling (1 week continuous class).

<b>FPM 432 Industrial Training</b>	<b>Credit-1</b>
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Students of B.Sc. Ag. Engg. will stay in different agricultural industries to get the practical training on manufacturing of Farm Power & Machinery.

<b>FPM 430 Project Work and Report</b>	<b>Credit-3</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>CSM 437 GIS and ICT</b>	<b>Credit 2</b>
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Fundamentals of GIS, GPS and ICT and their applications in Agriculture; GIS mapping and analysis software; GIS dictionary; Free GIS data depot; GPS data resource; GPS working; scope and application of ICT in GIS and GPS.

<b>CSM 438 GIS and ICT</b>	<b>Credit-1</b>
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Terminal use based on the Course CSM 437; Class assignments and project work.

<b>FPM 433 Ergonomics</b>	<b>Credit-2</b>
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Anthropometry-body measurements, posture, work-space layout, perception, sight, hearing, action, physical load, physical processes, thermal environment of agricultural workers, safety, mental load, mental processes, History and scope of ergonomics, Ergonomic model, Lifting, carrying; hand and foot-operated controls in agricultural equipment; Anthropometrics and work-place design, Time-measurement analysis, Perception: Sight, visual field and lighting, Noise problems and control, gases, engine exhaust, Mechanical vibrations and impact protection, Dynamic visual inspection; Action: Physical load, Physical processes; rest, pauses, Agriculture and climatic factors; Special considerations in agriculture: Design considerations for quantitative and qualitative displays, Mental loads; Applications of ergonomic principles: For the design of agricultural equipment, Processes in tropical climates, Guarding against machine hazards, creating effective safety messages, Field visits to labs and institutions.

<b>FPM 434 Ergonomics</b>	<b>Credit – 1</b>
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Laboratory based on the theory course.

<b>FPM 435 Livestock and Poultry Machinery</b>	<b>Credit – 2</b>
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Size reduction : Fineness modulus and uniformity index; Burr and Hammer mills, Crushers; Conveyors; Different types of Chopping, Pelleting and Feed Mixing Machines, Automatic feeder and waterers, Different types of milking machine, Separators: Centrifuge theory and practice; Cream separator, Butter churners, Heat exchangers: Types of heater and cooler; Steam boilers; Pasteurization and Pasteurizers, Principles of operation of different incubators and their maintenance, Principles of Refrigeration; Refrigeration systems and refrigerants, Ventilation systems, Housing & environmental control, Clearing & Washing Processes, Waste disposals & recycling,

<b>FPM 436 Livestock and Poultry Machinery</b>	<b>Credit – 1</b>
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Study on machines related to theory lectures.

<b>FPM 437 Technology, Gender &amp; Development</b>	<b>Credit – 3</b>
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Introduction to globalization and technological change; Basic concepts on gender and development; Office automation and gender; Women in development; informal sector and manufacturing sector; women in agriculture; changing gender relations and process of globalization; gender issues in technology relations – Women and third world industrialization, the electronics industry, information communication technology. Man-Machine (works environment) relationships: health and safety issues. Strategies for Solving gender based health and safety problems.

<b>Ag.Ext 429 Extension Communication Management</b>	<b>Credit- 3</b>
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Introduction: Concept of communication, need and importance of communication for agricultural development. Basic Communication Process: Steps in basic communication process intended message, encoding, transmission, reception, decoding and understanding, feedback in communication, distortion in the communication process, written communication, verbal communication, non-verbal communication, noise and barriers to written and verbal communication. Communication Networks and Patterns: Common communication networks-chain. Y wheel, circle, star and com-con: downward, upward, horizontal, one-way, patterns of communication. Communication Models and Elements: Lasswell, Shamon and Weaver, Barlo models of communication, source, message, channel, treatment of message, audience, audience response, characteristics/qualities of the key elements in the communication process noise in the communication process. Communication in Groups: Facilitation, increasing participation on the participants in the group communication qualities of a communication in the group communication handling trouble-makers in group communication.

<b>FPM 429 Project Planning &amp; Evaluation</b>	<b>Credit – 3</b>
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Project Identification and Formulation: Project Definition; Project Cycle; Participatory Planning; Stakeholder Analysis; Problem Tree and Project Formulation. Project Design Tools: Logical Framework, GANTT Chart; Planning case study; Implementation Planning: Project Specifications, Work Breakdown Schedules; Organizational Responsibility; Performance Plans and Time Schedules, Budget Planning; Project Control; Management Information Systems; Project Monitoring; Project Evaluation; Inspection and Audit Documentation and Reporting; Writing Project Reports; Presentation Skill and Communication; Project Appraisal: Feasibility Factors; Gender Issues; Financial Sustainability; Environmental Appraisal; Sustainable livelihood Framework.

<b>FS 421 Farm Building Design</b>	<b>Credit-2</b>
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Advances in farmhouses, Design Requirements: Classification of farmhouses, Zoo-metric data of farm animals and space requirements. Dairy Farms: General Planning and Design considerations of a dairy farm, Design of livestock buildings, Transport and milking systems, Poultry Farms, Basic design data for different types of houses, Miscellaneous Structures: Farmstead, Hay, Feed and Machine shed, Milking parlours, Farm sewage disposal. Heat loss from animals, Air exchange in livestock and poultry buildings, Planning and design of green houses.

<b>FS 422 Farm Building Design</b>	<b>Credit-1</b>
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Collection of zoo-metric data from Dairy and Poultry farm houses. Detail planning and design of Poultry and Dairy houses. Visit to dairy and poultry farms. Observation on modern livestock and poultry houses.

<b>FS 423 Silo and Storage Structure</b>	<b>Credit-2</b>
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Introduction: Storage principles, Climatic considerations, Grain Storage: grains losses, storage factors and method. Structural Design: Types of storage structure, Bin types, Grain pressure theories; Jenssen's, Airy's and Rankine's formula, Godowns and Bag-storage structures. Management and Control: Maintaining Insects, pests and fungus of stored grains and their controls. Fruits and Vegetable Storage, Storage method and quality control. Cold Storage: Types and design criteria. Processing and Packaging: Purposes, Material handling, Sorting, Processing, Package materials and packaging.

<b>FS 424 Silo and Storage Structure</b>	<b>Credit-1</b>
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Identification of the causes of grains losses at farm levels. Study on the types of storage structure used at farmers' level. Visit to Silo and Storage structures both at government and private sectors.. Observation on modern packaging materials and systems.

<b>FS 425 Environmental Impact Assessment</b>	<b>Credit-2</b>
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Introduction: Environmental quality standards, environmental impact assessment (EIA). About EIA: Aims & objectives, Impacts on environment: documentations, indices & indicators for describing the affected environment. Prediction & assessment of impacts: Air, water, ground water, soil, socio economic, visual, noise, cultural, biological environments. Decision making: Environmental monitoring: Purposes, techniques, application. EIA for Energy & agricultural projects, flood protection, irrigation & infrastructural development.

<b>FS 426 Environmental Impact Assessment</b>	<b>Credit-1</b>
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Prediction & assessment of different impacts: water, socio-economic, biological. Conducting EIA for certain schemes: agricultural projects, infrastructural development. Flood- mitigation projects.

<b>FS 430 Project Work and Report</b>	<b>Credit-3</b>
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<b>FS 427 Rural Housing and Sanitation</b>	<b>Credit-2</b>
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Housing: General requirement of housing, socio-economic aspects of housing, traditional building materials. Design and Performance of housing components: Floor, wall and roofing materials, aspects of strength and durability. Low cost housing: Development of building materials, physical and chemical treatments, cost analysis. Rural Sanitation: Problems and needs, sanitary options, developments of traditional sanitary systems. Domestic water use: Source, supply, hygiene and disposal.

<b>FS 428 Rural Housing and Sanitation</b>	<b>Credit-1</b>
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Planning and design of rural houses. Design of pan, well pit and septic tank. Testing of housing materials. Field demonstration and performance study of different sanitary items.

<b>FPM 423 Bio-Materials and Systems</b>	<b>Credit –3</b>
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Grain Structure, composition and properties, Thermo physical properties of grain, Physical properties of Agricultural materials, Geometric properties Kernel density and Bulk Density Thermal Properties of bulk grain, Hygroscopic Properties, Breakage resistance, Electrical properties, Optical properties:, Water storage in agricultural materials, rheology, Contact stress, Impact loading, Mechanical damage, Aerodynamic and hydrodynamic properties and phenomena, Friction problems, Wavering and pressing of agricultural materials, Cutting of agricultural materials, Grinding (comminution) of agricultural materials. Introduction of biosystems engineering, Energy in biological systems, Fluid power system, Biological waste management systems, Design of machine systems, System optimization.

<b>CSM 437 GIS and ICT</b>	<b>Credit-2</b>
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Fundamentals of GIS, GPS and ICT and their applications in Agriculture; GIS mapping and analysis software; GIS dictionary; Free GIS data depot; GPS data resource; GPS working; scope and application of ICT in GIS and GPS.

<b>CSM 438 GIS and ICT</b>	<b>Credit-1</b>
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Terminal use based on the Course CSM 437; Class assignments and project work.

<b>IWM 423 Irrigation Structure</b>	<b>Credit – 3</b>
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Types and uses of irrigation structures, Dams: Classification, Advantages, Selection of site and type of dams, Gravity Dam: Modes of failures, Stability analysis, Design of dam, Earthen Dams: Phreatic line, Causes of failure, Safe design; Design of filter, apron and cut-off walls; Seepage control measures, Stability analysis, Rubber Dam: Applicability, Canal Headworks: Description, Site selection, Constituent parts and their functions, Weir classification, Design of weir, Salient features of barrage, Cross Drainage Works: Description, aqueduct, Design of aqueduct and siphon aqueduct, Water Conveyance Structures: Description, Design of culvert, spillways, flumes and energy dissipation devices, Description and Design of drop structures, Chutes, Check gates, Turnouts and Diversions.

<b>IWM 424 Irrigation Structure</b>	<b>Credit-1</b>
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Design of gravity dam, Stability analysis of gravity dam, Design of earth dam, Determination of phreatic lines, Estimation of seepage discharge using flownet, Determination of uplift pressure on hydraulic structure, Design of weir, Design of aqueduct, Study of spillway and determination of discharge under different heads, Design of energy dissipators, Design of culverts, Design of flumes.

<b>IWM 425 Flood Control and River Training</b>	<b>Credit-2</b>
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Flood Problems, Types and causes of flood, Economic losses, Estimation of flood, Flood Control Measures: mitigation reservoirs, Channel improvement works, River dike or embankments, Diversion channel, Flood ways, Flood plain zoning - Land or watershed treatment, Spreading grounds; Flood forecasting and warning: Estimation of flood damages and control benefits, Cost-benefit analysis, Rivers: Types of rivers and their behavior, Rivers and their behavior in Bangladesh, River Training and Control Works: Objective and theories of river training works, Guide bank, Groyne, Cut-off, Pavement pitching, Brick revetment, Pitched island, Slope grading, Vegetal cover, Sheet pile, Percupine and other miscellaneous works, River bank protection methods in Bangladesh.

<b>IWM 426 Flood Control and River Training</b>	<b>Credit - 1</b>
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Measurement of river discharge using various devices, Measurement and sampling of sediment load in a river, Survey of a deteriorated river section for planning and designing of an improvement work, Numeric exercises, Field visits to different related institutes like Institute of Water Modeling, Dhaka; River Research Institute, Faridpur etc.

<b>IWM 427 Land and Watershed Management</b>	<b>Credit - 2</b>
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Objectives, watershed management in Bangladesh, River basins, Watershed characteristics, Land Grading and Forming in Watersheds, land grading, estimation of earth work volumes, Classification and Land use System: Agro-Ecological Zones (AEZs) of Bangladesh, Effects of land use and land capability, Runoff processes, Estimation of runoff from watersheds, Estimation of water yield, Runoff hydrographs, Sedimentation process, Sediment measurement, Sediment yield, Impacts of Forests on Watershed Hydrology: Shifting cultivation, Indigenous Technology Knowledge (ITK) in Watersheds: ITK documentation and its application in watershed management, Planning for Watershed Management: Data requirements for planning and economic analysis, Preparation of watershed work plan., Integrated Watershed Management: Strategy and conceptual teamwork, Participatory processes, Gender analysis in participatory watershed management.

<b>IWM 430 Project Work and Report</b>	<b>Credit-3</b>
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Each student should work on a particular topic approved by the Board of Studies (BOS) of the Department and under the guidance of a Departmental teacher. The project will be started at the beginning of Level 4: Semester I with a time-to-time presentation of its progress in a seminar to be arranged by the Head of the Department in consultation with the guiding teachers.

<b>IWM 429 Aquacultural Engineering</b>	<b>Credit-2</b>
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Engineering in aquaculture - Sources of water; Quantity, quality and environmental requirements, pumps and their uses in aquaculture, Ponds, Tanks and Other Impounding Structures: Types, design, layout and construction, Leveling and sealing, Tanks and raceways, Net retaining structures, Development of Small Watersheds for Aquaculture: Flooding nature and drainage system of watersheds, Aeration, Filtration and Disinfection of Farm Ponds: Oxygen transfer process, Aerators and their operating principles, Disinfection fundamentals, Fish Farm: Site selection and preconditions, Culture methods and planning; Planning and design of - fish farms, hatcheries, water control structures and supporting facilities, Economic Aspects of Fish Farm and Hatchery: Economic considerations in - site selection, construction, operation and maintenance of fish farm and hatchery.

<b>IWM 431 Land Reclamation Engineering</b>	<b>Credit - 2</b>
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Factors affecting soil fertility, Purposes and methods, Soil Ripening Processes: Physical and other ripening processes, Acid Sulphate Soils: Acidification processes, Neutralisation and reclamation, Diagnosis, Subsidence Prediction: Ripening subsidence, Settlement subsidence, Oxidation of peat soils, Pollution of Soils: Sources of pollution, Pollution transport process - convection, dispersion and diffusion processes; Mathematics of pollution transport, Soil Salinity: Forms, occurrence and distribution of salts in soils, Salinity problem, Diagnosis and assessment, Classification and mapping of saline soils, Salt balance, Reclamation and Management of Salt Affected Soils: Reclamation of saline, alkali and saline-alkali soils, Reclamation of low land: Reclamation by

hydraulic structures - polder, sluice gate etc.

<b>CSM 437 GIS and ICT</b>
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<b>Credit -2</b>
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Fundamentals of GIS, GPS and ICT and their applications in Agriculture; GIS mapping and analysis software; GIS dictionary; Free GIS data depot; GPS data resource; GPS working; scope and application of ICT in GIS and