आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

MASTER OF TECHNOLOGY

AGRICULTURAL ENGINEERING

(SOIL AND WATER CONSERVATION ENGINEERING)

[*w.e.f.* ACADEMIC SESSION 2018 – 19]

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102
Website: www.iftmuniversity.ac.in

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

Study and Evaluation Scheme

of

Master of Technology

Agricultural Engineering

(Soil and Water Conservation Engineering)

[*w.e.f.* Academic Session 2018 – 19]

Summary

Programme:	**Master of Technology** **Agricultural Engineering** **(Soil and Water Conservation Engineering)**
Programme Level:	**Degree (Post Graduation)**
Duration:	**Two Years (Four semesters) Full time**
Medium of Instruction:	**English**
Minimum Required Attendance:	**75%**
Maximum Credits:	**66**

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MORADABAD

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N.H-24 Lodhipur Rajput , Delhi Road, Moradabad, Uttar Pradesh-244102

www.iftmuniversity.ac.in

Effective from 2018-2019

Programme:

M. Tech. Agricultural Engineering (Soil and Water Conservation Engineering)

Programme Outcomes (POs):
Students completing this course will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem.
2. Capable of soil and water management system in the field of agriculture.
3. Demonstrate ability to Function Effectively Individually and also as a Team Member in Multidisciplinary activities.
4. Communicate Effectively in both Verbal and Written Forms
5. Identify the sources of water and their characteristics.
6. Design and manage water resources systems for optimal utilization
7. Optimum uses of land and water resources for sustainable development
8. Understand designs for water harvesting technology for conservation of land resources

School of Agricultural Sciences & Engineering, IFTMU

STUDY & EVALUATION SCHEME

M. Tech–Agricultural Engineering (Soil and Water Conservation Engineering)

YEAR - I, SEMESTER - I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**MSWE101**	**Watershed Hydrology**	3	0	0	20	10	30	70	100	3
2.	**MSWE102**	**Water Quality and Environment**	3	0	0	20	10	30	70	100	3
3.	**MSWE103**	**Soil and Water Conservation Engineering**	3	0	0	20	10	30	70	100	3
4.	**MSWE104**	**Elective I**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
						AI	AT				
5.	**MSWE151**	**Watershed Hydrology Lab**	0	0	2	40	10	50	50	100	1
6.	**MSWE152**	**Water Quality and Environment Lab**	0	0	2	40	40	50	50	100	1
.		**TOTAL**	**12**	**00**	**04**					**600**	**14**

YEAR - I, SEMESTER - II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**MSWE201**	**Open Channel Flow**	3	0	0	20	10	30	70	100	3
2.	**MSWE202**	**Planning and Management of Watershed**	3	0	0	20	10	30	70	100	3
3.	**MMAG204**	**Agricultural Statistics and Experimental Designs**	3	0	0	20	10	30	70	100	3
4.	**MSWE203**	**Elective II**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
						AI	AT				
5.	**MSWE251**	**Open Channel Flow Lab**	0	0	2	40	10	50	50	100	1
6.	**MMAG254**	**Agricultural Statistics and Experimental Designs Lab**	0	0	2	40	40	50	50	100	1
			12	**00**	**04**					**600**	**14**

School of Agricultural Sciences & Engineering, IFTMU

STUDY & EVALUATION SCHEME

M. Tech–Agricultural Engineering (Soil and Water Conservation Engineering)

YEAR - II, SEMESTER - III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**MSWE301**	**GIS and Remote Sensing for Land and Water Resources Management**	3	0	0	20	10	30	70	100	3
2.	**MSWE302**	**Sediment Transport**	3	0	0	20	10	30	70	100	3
3.	**MSWE303**	**Elective III**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
						AI	AT				
4.	**MSWE351**	**GIS and Remote Sensing for Land and Water Resources Management Lab**	0	0	2	40	10	50	50	100	1
5.	**MSWE352**	**Seminar**	0	0	4	-	100	100	-	100	4
6.	**MSWE353**	**Pre-Dissertation**	0	0	4	-	50	50	50	100	4
		Total	**09**	**00**	**10**					**600**	**18**

YEAR - II, SEMESTER - IV

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
PRACTICALS / PROJECT											
1.	**MSWE451**	**Dissertation Work**	**-**	**-**	20		300	300	300	600	20
		Total	**-**	**-**	**20**					**600**	**20**

School of Agricultural Sciences & Engineering, IFTMU

STUDY & EVALUATION SCHEME

M. Tech–Agricultural Engineering (Soil and Water Conservation Engineering)

List of Electives

Elective I

S.N.	CODE	Name of Elective
1.	MSWE104 A	Ground Water Engineering
2.	MSWE104 B	Design of Pumps for Irrigation and Drainage

Elective II

S.N.	CODE	Name of Elective
1.	MSWE203 A	Design of Farm Irrigation Systems
2.	MSWE203 B	Flow through Porous Media

Elective III

S.N.	CODE	Name of Elective
1.	MSWE303 A	Crop Environmental Engineering
2.	MSWE303 B	Design of Surface Irrigation System

MSWE101 Watershed Hydrology L:T:P 3:0:0

Objectives:

- To familiarize the students with the important aspects of watershed hydrology.
- To impart the knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.
- The main aim of watershed management is to conserve the soil, plant, and water resources of a catchment while benefiting humanity. All environmental, social, and economic concerns are combined to treat watersheds in an integrated manner.

UNIT I

Hydrologic processes and systems, Hydrologic problems of small watersheds, Hydrologic and geomorphologic characteristics of watersheds.

UNIT II

Measurement and analysis of hydrologic parameters, rainfall-runoff models, and stream flow measurement and analysis of data.

UNIT III

Hydrograph analysis, Unit hydrograph theory, Synthetic and dimensionless hydrograph, IUH, convolution of unit hydrograph.

UNIT IV

Concept of hydraulic flood routing, flood routing (reservoir and channel routing) Methods.

UNIT V

Definition and concept of different types of hydrologic models for simulation of hydrologic problems.

Course Outcomes:

At the end of the course, the students will be able to:

- Understand different components of hydrologic cycle and their importance
- Compute areal rainfall and runoff on a watershed scale
- Develop rainfall-runoff relationship for a watershed for prediction purpose
- Apply the knowledge on hydrology for planning watershed management projects
- Able to understand and analyze the process and the effect of various climatic parameters.

- Able to develop the competency of hydrological parameter analysis.
- Able to develop the competency data transformation, calibration and evaluation of hydrologic models and computer simulation.

References:

1. Chow VT, David, M & Mays LW. 1988. Applied Hydrology. McGraw Hill.
2. Ghanshyan Das 2000. Hydrology and Soil Conservation Engineering. Prentice Hall.
3. Sigh, V.P. Elementary hydrology., Practice Hill of India Pvt. LTD. NewDelhi
4. Subramanya, K. Engineering Hydrology. Tata McGraw-Hill Publishing Company Limited New Delhi

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MSWE151 Watershed Hydrology Lab L:T:P0:0:1

List of Experiments:

Minimum 08 experiments out of the following:

1. Study of different types of rain gauges
2. Exercise on analysis of rainfall data
3. Geomorphologic characteristics of watershed.
4. Runoff computation
5. Construction of hydrograph
6. Hydrograph analysis
7. Exercise on flood routing problems
8. Hydrologic models
9. Study of stage recorders and current meters
10. Visit to watershed and dam sites.

MSWE102 Water Quality and Environment L:T:P 3:0:0

Objective:

- To familiarize the water quality in relation to domestic, industrial and agricultural activities.
- To impart awareness of impurities which contaminated the surface and ground water and also give the awareness on its control and management measures.
- To introduce students to how the common environmental experiments relating to water and wastewater quality are performed.

UNIT I

Introduction to non-point and point source of pollution, basic causes of pollution, impact of pollution on environment, stream water quality, control of non-point source of pollution, utilization, recovery and recycling of solid and liquid wastes.

UNIT II

Movement of pollutants in aquatic environment, water quality parameters, concepts and analysis impurities and water quality characterization, Physical, chemical and Biological parameters, analytical estimation.

UNIT III

Effect of global warming and climatic change on soil and water quality, Analysis and interpretation of water quality data, statistical techniques for data analysis.

UNIT IV

Analysis for correlations, variability, trends etc water quality modeling, mathematical modeling on pollution control, Water quality legislation and management, water quality criteria and standards.

UNIT V

National and International perspective, surface and groundwater quality management, environment impact assessment, introduction to environment impact assessment – concept and methodologies, case studies

Course Outcomes:

At the end of this course, the student will be able to

- Able to determine the water quality parameter which is recommended for agriculture, domestic and industrial purpose.
- To develop the common understanding of water treatment or sewage treatment plants.
- Able to understand modelling studies in water pollution, Pollution control laws and their enforcement mechanism.

References:

1. Robert A. Corbitt., San Francisco, Washington, D.C., AucklandStandard Handbook of Environmental Engineering, Second Edition,. McGraw-Hill Companies, Inc.
2. **Deng**, X., **Wang**, Y., **Wu**, F., **Zhang**, T., **Li**, Z. Integrated River Basin Management
3. **Tjeerdema**, Ronald S. (Ed.), Aquatic Life Water Quality Criteria for Selected Pesticides

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MSWE152 Water Quality and Environment Lab L:T:P 0:0:1

List of Experiments:

1. Determination of pH, dissolved and suspended solids
2. Determination of chlorides and sulphates
3. Determination of turbidity and hardness
4. Determination of BOD and COD
5. Determination of Nitrogen (ammonical, nitrate, nitrite) and MPN
6. Determination of Total count of bacteria in water/ sewage samples
7. Estimation of chemical amendments to maintain qualities of soil and water

MSWE103 Soil and Water Conservation Engineering L:T:P 3:0:0

Objectives:

To have understanding about the degradation of productive soil globally and its effect thereon, also to know about the causes about water scarcity and their solution to fight against the evil effects through soil and water conservation technologies**.**

UNIT I

Probability theory and distributions, planning of soil and water conservation measures.

UNIT II

Design of soil and water conservation structures -contour bund, graded bund and terraces.

UNIT III

Hydrologic jump and energy dissipation, gully control structures, check dams, Design of permanent soil conservation structures

UNIT IV

Earthen dams, seepage through dams and stability analysis.

UNIT V

Water harvesting and recycling, flood control and stream bank protection.

Course Outcomes:

The student will be able to:

- Know about the causes about water scarcity and their solution to fight against the damage effects through soil and water conservation technologies.
- Recognize different types of erosion, rainfall and runoff.
- Design and construct a simple earth dam and ponds for farm use,
- Understand the concept of Universal Soil Loss Equation (USLE) with respect to soil loss.

References:

1. Suresh, R. (1993). Soil and Water Conservation Engineering.. Standard Publishers and Distributors, Delhi.
2. Garg, S.K. (1987). Irrigation Engineering and Hydraulic Structures. Khanna Publishers, New Delhi.

3. Kirkby, M.J. and Morgan, P.P.C. (Eds.). (1980). Soil Erosion. John Wiley and Sons. New York, USA.
4. V.V.N. Murthy. Land and water management engineering, Kalyani Publication.
5. R.V. Singh:Watershed Planning and management, Yash. Publ.
6. Ghanshyam Das: Hydrology and Soil Conservation Engg-Including Watershed Management.

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MSWE201 Open Channel Flow L:T:P 3:0:0

Objective

- To develop a basic knowledge of open channel flow relationships by applying fluid properties, hydrostatics, and the conservation equations for mass, momentum, and energy
- Introduction to the basic concepts of free surface flows
- Description of the equations of varied flow and basic concepts of Fluvial Hydraulics

UNIT I

Open channel and their properties, Energy and momentum principles, Critical flow computations and applications.

UNIT II

Uniform flow. Its development, Formula and design computation.

UNIT III

Boundary layer concept. Surface roughness, Velocity distribution and instability of uniform flow.

UNIT IV

Gradually varied flow theory and analysis, Method of computations.

UNIT V

Hydraulic jump and its use as leveling energy dissipation, Spatially varied flow, Unsteady flow. Rapidly varied flow.

Course Outcomes:

Upon completion of the Environmental Engineering course, the students are expected to be able to:

- To develop the common understanding of open channel flow and their properties as well as its application.
- To develop the common understanding that how hydraulic jump formed in open channel and how much dissipated kinetic energy.
- To impart the knowledge of various type of flow occur during flowing in channel and their characteristics.

References:

1. Henderson FM.1966. Open Channel Flow. Macmillan.

2. Subramaninum K,. 1960. Open Channel Flow. McGraw Hill.
3. Ven T Chow. 1959. Open Channel Flow. McGraw Hill.

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MSWE251 **Open Channel Flow Lab** **L:T:P 0:0:1**

List of Experiments:

1. Exercise on open channels and flow conditions.
2. Exercise on hydraulic jumps
3. Study of sub critical, critical and super critical regions.
4. Exercise on energy and momentum equations.
5. Study and characteristic of gradually varied flow (GVF).
6. Study and characteristic of Spatially varied flow (SVF).
7. Analysis of Critical flow computations.

MSWE202 Planning and Management of Watershed L:T:P 3:0:0

Objectives

- **T**o acquaint the students about the preparation of the detail report of the problems and causes related to the water, land, vegetation and social aspects of specific area and their remedies through watershed planning and management.
- The student will get a comprehensive idea about watershed management.
- The student will be capable of planning and execution of watershed management projects

UNIT I

Watershed - concept and management, types of watershed, watershed characteristics deterioration of watershed, land capability classification, watershed delineation, delineation of priority watershed, coding of watershed, analysis of watershed. .

UNIT II

Watershed management: factors affecting, site selection, watershed management practices, lanning of watershed works, guidelines for project preparation, formulation of project proposal for watershed management works, steps of watershed management.

UNIT III

Evaluation and monitoring of watershed programmes, Hydrology of forest watersheds, hydrologic process affected, evaporation, transpiration, interception, infiltration and depression storage.

UNIT IV

Hydrologic evaluation of land treatment, erosion and sedimentation in forest watersheds Agricultural watersheds, sodic saline watersheds, water logging, declining water table pesticides, and insecticide.

UNIT V

Common guidlines for watershed development projects, Participatory watershed management case studies.

Course Outcomes:

At the end of the course, the students will be able to-

- Understand different components of hydrologic cycle and their importance
- Compute areal rainfall and runoff on a watershed scale

- Develop rainfall-runoff relationship for a watershed for prediction purpose
- Apply the knowledge on hydrology for planning watershed management projects

References:

1. Dhurvarayana,V.V Sastry,G,and U.S Patnaik. 1990. watershed Management. Indian Council of Agricultural Research. New Delhi
2. Raj vir singh. 2000. Watershed Planning and Management. yash Publishing House
3. Murthy VVN. 1998. Land and Water Management Engineering, Kalyani Publishers.
4. Chow V.T .1988. Applied Hydrology, McGraw Hill, New York

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MMAG 204 Agricultural Statistics and Experimental Design L:T:P : 3:0:0

Objective: The main aims of this course are to provide comprehensive knowledge of the basic information of agriculture statistics and experimental design.

Unit I

Presentation of Data: Frequency distributions; graphical presentation of data by histogram, frequency polygon, frequency curve and cumulative frequency curves Measures of Locations and Dispersion: Mean, median, mode and their simple properties (with-out derivation) and calculations of median by graphs; range, mean deviation, standard deviation, standard error, coefficient of variation.

Unit II

Probability and Distributions: Random distributions; events exhaustive, mutually exclusive and equally likely; definition of probability (with simple exercises); definitions of binomial, Poisson's and normal distributions; and simple properties of the above distributions (without derivation)

Unit III

Correlation and Regression: Bivariate data-simple correlation and regression coefficients and their relation; Spearman rank correlation; limits of correlation coefficient; effect of change of origin and scale on correlation coefficient; linear regression and equations of line of regression; association and independence of attributes.

Unit IV

Sampling: Concept of population and sample; random samples; methods of taking a simple random sample. Tests of significance: sampling distribution of mean and standard error; z and t-test (equality of means; paired and unpaired t-test); t-test for comparison of means when variances of two populations differ; Chi- square test for goodness of fit; independence of attributes, and homogeneity of samples; interrelation between t-test and F-Test.

Unit V

Experimental Designs**:** Principles of experimental designs; completely randomized, randomized complete block design (missing plot value in RBD); latin square designs; augmented block design; simple factorial experiments including split and strip plot design

(mathematical derivations not required); analysis of variance (ANOVA) and its use including estimation of LSD (CD).

Course Outcomes:

The student is able to

- Understand basic theoretical and applied principles of agricultural statistics needed to enter in agriculture.
- Demonstrate an understanding of the basic concepts of probability and random variables.
- Understand and interpret the concepts of descriptive statistics from the obtained data.
- Utilize and apply regression and other statistical methods to analyze commodity markets and economic data.
- Gain proficiency in using statistical software for data analysis.

References:

1. J, Medhi: Statistical Methods, New age International (P) Ltd.
2. J.K. Goyal & J.N. Sharma, Mathematical Statistics.
3. J.K. Ghosh, Mathematical Statistics, John Wiley & Sons, New York.
4. S.C. Gupta & V.K. Kapoor .Advanced Statistics, S. Chand.
5. M. Ray, Mathematical Statistics, R.P & Sons, Agra.
6. Goulden, C.H. (1952). Methods of Statistical Analysis, 2/e, John Wiley, New York
7. Kempton RA and Fox PN (1997). Statistical Methods for Plant Variety Evaluation.
8. Chapman and Hall.
9. Panse, V.C. and Sukhatme, P.V. (1967). Statistical Methods for Agricultural Workers,
10. I.C.A.R., New Delhi.

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- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- www.onlinecourses.nptel.ac.in
- www.en.wikipedia.org

MMAG 254 Agricultural Statistics and Experimental Design Lab L:T:P 0:0:1

List of Experiments:

1. Measurement of central tendency and dispersion
2. Standard deviation and standard error
3. Principle uses of χ^2 , F and T- test.
4. Correlation Coefficient, Regression coefficient and Regression equation.
5. Analysis of data generated from completely randomized design, randomized block design.
6. Analysis of data generated from Latin square design, factorial experiments in 2^2, 2^3 Split plot designs
7. Missing plot techniques.
8. Analysis of covariance.
9. Sampling in field experiments.
10. Analysis of variance (ANOVA).

MSWE301 GIS and Remote Sensing for Land and Water Resources Management

L:T:P 3:0:0

Objectives

- To provide exposure to students in gaining knowledge on concepts and applications leading to modeling of earth resources management using Remote Sensing, GIS and GPS technologies.
- To acquire skills in storing, managing digital data for planning and development.
- To introduce the fundamentals of remote sensing and geographical information systems and to inculcate ability to apply principles and techniques of GIS and remote sensing in hydrology.

UNIT I

Basic principles of remote sensing and sensors. Elements of photogrametry.

UNIT II

Electromagnetic spectrum. Energy interaction with surface features Aerial photo and satellite imagery, Photo and image interpretation.

UNIT III

Principles of Geographical Information System tools, their types and capabilities, Advantages of GIS over conventional methods.

UNIT IV

Importance of ground truth establishment, GIS and remote sensing for land and water resources data collection, analysis and interpretation.

UNIT V

Application of GIS in water and land resource development and management.

Course Outcomes:

At the end of this course, the student will be able to

- Understanding of aerial photography and interpretation.
- Able to use satellite remote sensing to perform image analysis and classification for developing thematic maps.
- Able to integrate satellite data with GIS to undertake recourse mapping and planning studies.

References:

1. De Mess M.N. 2004. Fundamental of Geographic Information System. John Wiley & Sons.
2. Lille Sand T & Kaiffer R.1987. Remote Sensing and Image Interpretation. John Wiley & Sons.
3. Sabbins F.1987. Remote Sensing Principle and Interpretation. Freeman

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MSWE351 GIS and Remote Sensing for Land and Water Resources Management Lab

L:T:P 0:0:1

List of Experiments:

1. Familiarization with remote sensing and GIS
2. GIS Software and their principle of working
3. Methods of establishing ground truth points,.
4. Comparison between ground truth and remotely sensed data.
5. Application of GIS packages.

MSWE 302 Sediment Transport L:T:P 3:0:0

Objective:

The course is to provide the student with an water **flow** and stream **flow** analyses, erosion and **sedimentation**, fluvial

Unit I

Origin and formation of sediment; fundamental properties of individual sedimentary particles, bulk properties of sediment, incipient motion of sediment particles; competent velocity, lift concept critical tractive force.

Unit II

Bed load transport and saltation, bed load equations, Total load transport, microscopic and macroscopic methods, Sediment yields from watersheds, factors affecting sediment yield, modeling and prediction of sediment yield, Musgrave equation.

Unit III

Universal soil loss equation and, its application to agricultural watersheds, MUSLE etc, sediment delivery ratio method, factors affecting sediment delivery ratio, determination of sediment delivery ratio, Dendy -Bolton method, regression analysis.

Unit IV

Runoff sediment relation, sediment concentration graph, unit sediment graph, instantaneous unit sediment graph, series graph, System models, unit impulse response, step response and unit pulse response functions and their application on sediment problems.

Unit V

Sediment samplers and sampling, bed load sampling, suspended load sampling, sediment control measures

Course Outcomes:

At the end of this course, the student will be able to

- Able to estimate the sediment from the particular watershed by using various instruments.
- To develop the common understanding of mechanics of sediment transportation process andremedies to reduce this.

- Able to design and install the sediment observation post at the outlet of any watershed foranalyzing the efficacy of installed structures.

References:

1. R. J. Garde, K. G. Ranga Raj., Mechanics of Sediment Transportation & Alluvial Stream Problems, Willey Eastern Limited New Delhi.
2. Walter Hans Graf., Hydraulics of Sediment Transport. Water Resources publication. LLC.
3. Chih Ted Yang., Sediment Transport: Theory and Practice., ISBN

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MSWE104 I **Ground Water Engineering** **L:T:P 3:0:0**

Objectives:

- A pathway to understand the basic physical principles of groundwater flow, differential equations, boundary condition and groundwater quality.
- Knowledge of various aspects of recharge of groundwater.
- Exposure to use the numerical solutions to solve problems with complex realistic situations.

UNIT I

Properties affecting groundwater storage and movement, groundwater balance Studies.

UNIT II

Well hydraulics, two dimensional flow steady and unsteady state flow in confined, unconfined and semi-confined aquifers.

UNIT III

Steady flow in sloping aquifers, partial penetrating wells, analysis of multi-aquifers, Flow analysis in interfering wells.

UNIT IV

Pumping tests and determination of aquifer parameters, groundwater modeling for water resources planning.

UNIT V

Techniques for groundwater recharge.

Course Outcomes:

- After completion of course student will be able to analyze storage, movement and flow characteristics of different aquifers.
- Able to model ground water and plan for ground water recharge.

References:

1. Todd DK. 1997. Ground Water Hydrology. Wiley Eastern.
2. Boonstra J&de Ridder NA. 1981. Numerical Modeling of Groundwater Basins. ILRI.
3. Domenico PA. 1972. Concept and Models in Groundwater Hydrology. McGraw Hill.
4. Hantush MS. (Ed.).1964 Advances in Hydro Sciences. Vol. I. Academic Press.
5. Raghunath HM. 1992. Ground Water. Wiley Eastern.

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MSWE104 II Design of Pumps for Irrigation and Drainage L:T:P 3:0:0

Objectives:

- To acquaint students with the design and management of landscape irrigation systems
- To expose the students the various principles of irrigation methods
- To inculcate the different types of irrigation and drainage systems and their performance based on service oriented approach.

Unit I

Basic hydraulic design of centrifugal pump, water hammering problem in centrifugal pump.

Unit II

Principle and performance characteristics of vertical turbine pump, submersible pump and axial flow pump and their design.

Unit III

Non-conventional energy sources for pumping, wind mills, micro turbines, solar pumps.

Unit IV

Hydraulic ram- their selection and design criteria.

Unit V

Design of pumping station, techno-economic evaluation, Energy conservation measures for pumping systems.

Course Outcomes:

At the end of this course, the student will be able to

- Understanding of irrigation technologies and systems.
- Able to select the pump for desired discharge to be pumped from particular water source bydeveloping pump characteristics curve.
- Able to analyze the flow in different types of pump.
- Able to design the pumping station for managing the irrigation and drainage system

References:

1. Church AH & Jagdish Lal 1973. Centrifugal Pumps and Blowers. Metropolitan Book Co.
2. Michael AM & Khepar SD. 1989. Water Well and Pump Engineering. Tata McGraw Hill.

3. Michael AM. 1990. Irrigation Theory and Practice. Vikas Publ. House.
4. Modi PN & Seth SM. 2000 Hydraulic and Fluid Mechanics. Standard Book House.

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MSWE203 A Design of Farm Irrigation Systems L:T:P 3:0:0

Objective

Principles of design creep theory – seepage force and safety against piping – inverted filter– uplift pressure – design considerations for protection works.

UNIT I

Concepts of Irrigation; Irrigation principles, losses, conveyance, distribution; Application, scheduling parameters, water budgeting.

UNIT II

Surface irrigation, hydraulics of water advance and recession, hydraulic resistance to flow, gravity irrigation.

UNIT III

Design of Border irrigation, furrow irrigation, check basin irrigation, Sub Irrigation methods and concepts.

UNIT IV

Preliminary design criteria of sprinkler and micro irrigation systems, hydraulics of sprinkler and micro irrigation systems.

UNIT V

Design of lateral, sub main and main line of sprinkler and micro irrigation. Fertigation aspects.Underground water conveyance system, Evaluation of irrigation systems and practices.

Course Outcomes:

At the end of this course, the student will be able to

- Able to identify principle losses and develop water budgeting for farms.
- Develop understanding of hydraulics of water advance and recession of irrigation stream.
- Design surface irrigation system, sub irrigation system and pressurized irrigation system.

References:

1. Finkel HJ. 1983. Handbook of Irrigation Technology. Vols. I-II. CRC Press.

2. Peri G & Todes M. 1985. Irrigation Systems Design and Operation. Oxford Univ. Press.
3. Pillsbury AF. 1972. Sprinkler Irrigation. FAO Agricultural Development Paper No. 88, FAO.
4. Sivanappan RK. 1987. Sprinkler Irrigation. Oxford & IBH

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MSWE203 B **Flow through Porous Media** **L:T:P 3:0:0**

Objectives:

- Describe the physical nature and derive properties of porous media
- Describe flow dynamics in porous media
- Derive Darcy's Law
- Derive and manipulate equations governing saturated and unsaturated flows in porous media

UNIT I

Aquifer and fluid properties, Forces holding water in soils, Hydrodynamics in porous media and the limitations of the governing laws,

UNIT II

Initial and boundary conditions, Dupuit and Boussinesque approximations and linearization techniques, stream and potential functions,

UNIT III

Flow net and its use for subsurface flow quantification, Solutions of confined and unconfined flow problems,

UNIT IV

Unsaturated flow theory and simulation of soil moisture dynamics, Analysis of seep-age from canals, Groundwater flow modeling,

UNIT V

Saline water-fresh water interface and interactions, Solute transport, Analysis and solution of groundwater flow problems.

Course Outcomes:

At the end of this course, the student will be able to

- Understanding of physical properties of flow through porous media.
- Competence on various laws governing dynamics of flow through porous media.
- Understanding of hydrodynamics in porous media, governing laws and boundary conditions

References:

1. Muskat, M. and Wyckoff, R.D. (1946). The Flow of Homogeneous Fluids through Porous Media. J.W. Edwards Inc. USA.
2. Polubarinova-Kochina, P.Ya. (1962). Theory of Ground Water Movement. PrincetonUniversity Press. USA.
3. Harr, Milton E. (1962). Groundwater and Seepage. Mc-Graw Hill Book Co. USA.
4. Remson I., Hornberger, G.M. and Molz Fred, J. (1971). Numerical Methods in Subsur-face Hydrology. Wiley-Interscience.
5. Beer, Jacob. (1972). Dynamics of Fluid Flow in Porous Media. American Elsevier, Amsterdam

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MSWE 303 I Crop Environmental Engineering L:T:P 3:0:0

Objectives

- To familiarize the students with various water treatment and sanitary engineering principles and applications.
- To understand the natural environment and its relationships with human activities andtocharacterize and analyze human impacts on the environment.

UNIT I

Aerial and edaphic environments for plant growth, energy and mass transfer in and above crop canopies.

UNIT II

Climatic changes and plant response to environmental stresses, evapotranspiration models. Instrumentation and techniques for monitoring plant environments.

UNIT III

Processes and aspects of growth and development, soil-root interface, root sink functions.

UNIT IV

Water movement in soil-plant atmosphere continuum, artificial environments and plant behavior.

UNIT V

Design and operation of controlled environment facilities and their instrumentation. Crop growth and yield modeling.

Course Outcomes:

At the end of this course, the student will be able to

- To develop the common understanding aerial and edaphic environments for plant growth, energy and mass transfer which help to maximizing the crop yield.
- To understanding the basic interface of soil and root and its characteristics.
- Able to identify climatic changes on plant and how plan are response to environmental stresses, evapotranspiration.

References:

1. Ghildyal BP & Tripathy RP. 1987. Fundamental of Soil Physics. Wiley Eastern.
2. Slatyor OP. 1967. Plant Water Relationship. Academic Press.
3. McMahon, Margaret E., Kofra., Plant science growth: Growth, Development and utilization, ISBN

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MSWE 303 II Design of Surface Irrigation System L:T:P 3:0:0

Objectives

- Irrigation systems principles and design procedures for design and operation of sprinkler, trickle, and surface irrigation systems.
- To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management
- The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part.
- To develop analytical skills relevant to the areas mentioned above, particularly the design of irrigation and drainage projects.

UNIT I

Historical evidence of development and progress of farm irrigation systems, Land irrigability, Theory of Infiltration and its measurement.

UNIT II

Methods of irrigation - their suitability and limitations, Water advance and recession in surface irrigation.

UNIT III

Design of surface irrigation systems, Surge irrigation and its design, Irrigation water quality, Leaching requirement of salt affected soils, Use of saline water for irrigation.

UNIT IV

Irrigation scheduling and equity in water distribution, optimal layout of conveyance network-shortest route and minimum spanning tree options.

UNIT V

L-sectioning of water conveyance network, Channel lining to control seepage loss and its economics, Environmental impact of irrigation projects, Case studies.

Course Outcomes:

At the end of this course, the student will be able to

- Selection of suitable method of surface irrigation based on land irritability and infiltration characteristics.
- Design and evaluation of various surface irrigation methods.

- Design optimum layout, conveyance network for efficient use water in surface irrigation system

References:

1. Michael, A.M. Irrigation Theory and Practice. Vikas Publ. New Delhi.
2. Jensen, M.E. (Editor). (1983). Design and Operation of Farm Irrigation Systems. ASAE
3. Monograph No. 3. USA.
4. Walker, W.R. and G.V. Skogerboe. (1987). Surface Irrigation: Theory and Practice..
5. Withers, Bruce and Vipond, Stanley. (1974). Irrigation: Design and Practice. B.T. Batsford.

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