SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
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---------AGRICULTURAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech				
Subject Category	DC	Subject Code:	AG-1851	Subject Name:	**Irrigation Engineering**				
Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	30	20	150	3	-	2	4

Prerequisites:

Course Objective:

At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.

Course Outcomes:

After completion of the course, the student will be able to:

1. The student will gain knowledge on different methods of irrigation & Soil plant water relation.
2. Knowledge of different water lifting pumps and their operation
3. Method for measurement of irrigation water
4. Design of Drip & Sprinkler irrigation system

UNITs	Descriptions	Hrs.	CO's
I	**Introduction**-Irrigation; impact of irrigation on human environment; purpose of irrigation; source of irrigation water; India water budget; river system of India; advantage and disadvantage of irrigation. **Soil plant water relationship** Saturation point; field capacity; moisture equivalent; wilting point; permanent wilting point; Evaporation; transpiration ; evapotranspiration ; evaporation measurement;	7	CO1
II	**Irrigation Methods** surface irrigation method and design; wind speed; crop growth stage and crop coefficient ; modified penman equation; crop water requirement; net irrigation requirement ; gross irrigation requirement; irrigation frequency; irrigation period; irrigation management; irrigation efficiency and based numerical problem.	8	CO1
III	**Water Lift and Pumps-** classification of pumps; performance and adaptability of common type indigenous water lift; application of non-conventional energy in pumping; positive displacement pumps; variable displacement pumps; specific speed of pumps; pump characteristics; terminology; effective speed and impeller diameter on pump performance; centrifugal	9	CO2

	pump- principle of operation, classification ; type of impeller; operation, maintenance and troubleshooting; submersible pump; selection of pump; power requirement; efficiency and economy of pumping plant.		
IV	**Measurements of irrigation water**- unit of measurement of water; method of water measurement ; weirs and flume; orifices and water gate; open channel; design of open channels; terminology; estimating velocity of flow in open channels; drop structure.	8	CO3
V	**Micro Irrigation** **Sprinkler irrigation**-adaptability; types; component; uniformity coefficient; design of sprinkler irrigation system; cost estimation; operation and maintenance of sprinkler system; **Drip irrigation**-component; installation; emitter selection; emission uniformity; design and layout of drip irrigation.	8	CO4
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Measurement of soil moisture by different soil moisture measuring instruments.
2. Measurement of irrigation water.
3. Measurement of infiltration rate.
4. Computation of evaporation and transpiration.
5. Measurement of uniformity coefficient of sprinkler irrigation method.
6. Measurement of uniformity coefficient of drip irrigation method.

Text Book-

1. Irrigation Theory and practice by A.M. Michael, new Delhi vikas publication
2. Principles of Agril. Engg. Vol-II by A.M. Michale and T.P. Ojha, Jain brother, New Delhi

Reference Books-

1. Soil and water conservation by Schwob, G.O. frevert, R.K. Edminister, T.W. barnes, K.K., John wiley and Sons Inc. New York
2. Sprinkler and trickle irrigation by Keller Jack 1990, Van Nastrund Reinhold 115 fifth avenue new York

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

Recommendation by Board of studies on	

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SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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---------AGRICULTURAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech
Subject Category	DC	Subject Code:	AG-1852	Subject Name:	**Surveying & Geomatics**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	30	20	150	3	-	2	4

Prerequisites:

Course Objective:

The students are expected to understand the importance of surveying in the field of civil engineering and to learn the basics of linear/angular measurement methods like chain surveying, compass surveying, plane table surveying in plan making, levelling and theodolite survey in elevation and angular measurements & tachometric survey for distance and height measurement

Course Outcomes:

After completion of the course, the student will be able to:

1. Identify the concept of surveying, levelling and contouring and carry out linear and angular measurements required by different methods of surveying
2. Carry out traversing, trigonometrically levelling and tachometry using appropriate instruments and perform calculations
3. Identify different types of curves and perform calculations for setting out
4. Explain the triangulation principle and its application in control survey
5. Demonstrate the knowledge of hydrographic surveying, photographic surveying and remote sensing.

UNITs	Descriptions	Hrs.	CO's
I	Introduction to Surveying- Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Local attraction, Declination, Dip, Latitude and Departure. Levelling: Principles of levelling- Dumpy level booking and reducing levels, Methods- simple, differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling, Trigonometric levelling: Indirect levelling, levelling on steep ground- methods. Contouring: Characteristics, methods, uses.	9	CO1
II	Traversing by theodolite, Field work checks, traverse computations, latitude and departures, adjustments, computations of co-ordinates, plotting & adjusting or traverse, Omitted measurements, Measurement EDM, Trigonometrical levelling. Tachometry: Tachometric systems and principles, stadia system, uses of antilattices, tangential system, sub lense system, instrument constant, field work reduction, direct-reading tachometers, use of tachometry for traversing and contouring.	8	CO2
III	Curves: Classification and use; elements of circular curves, calculations, setting outcurves by offsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral and	7	CO3

	lemniscates, vertical curves, setting out.		
IV	Control Surveys: Providing frame work of control points, triangulation principle, cognisance, selection and marking of stations, angle measurements and corrections, baseline measurement and corrections, computation of sides, precise traversing.	8	CO4
V	Hydrographic Surveying: Soundings, methods of observations, computations and plotting. Principles of photographic surveying: aerial photography, tilt and height distortions, Remote sensing, simple equipment's, elements of image interpretation, image-processing systems.	8	CO5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Chain Surveying
2. Plane table Surveying
3. Compass surveying
4. Levelling by auto level
5. Measurement of Angle by theodolite
6. Plotting a closed Traverse in field by using Theodolite.
7. Plotting an open Traverse in field by sing Theodolite
8. Determination of constants of Tachometers
9. Measurement of Horizontal Distance by stadia Tachometer
10. Measurement of Height and distances by Tangential Tachometry.
11. To Settling and simple curve by linear methods.

Text Book-

1. T.P. Kanetkar, Surveying &Levelling, Vol. I & II.
2. Duggal; Surveying vol I and II; TMH
3. Basak; Surveying and Levelling; TMH
4. R.E.Devis, Surveying theory & Practice, Mc.Graw Hill, New York

Reference Books-

1. David Clark & J Clendening, Plane & Geodetic surveying Vol. I & II, constable & Co, London.
2. S.K. Roy, Fundamentals of surveying, prentice - Hall of India New Delhi
3. B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi
4. K.R. Arora, Surveying Vol. I & II, standard book House, New Delhi

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

https://swayam.gov.in/nd1_noc20_ce51/preview

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---------AGRICULTUAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech				
Subject Category	DC	Subject Code:	AG-1853	Subject Name:	**Farm Machinery & equipment**				
Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	30	20	150	3	-	2	4

Prerequisites:

Course Objective:

The students will be able to understand the mechanization and various equipment used in the farm for different field operations.

Course Outcomes:

After completion of the course, the student will be able to:

1. To introduce the students to the working principles of farm & tillage implements.
2. To expose the students to farm mechanization benefits and constraints, identification of components of primary and secondary tillage implements
3. Types, components & working principle of different farm machinery

UNITs	Descriptions	Hrs.	CO's
I	**FARM MECHANIZATION** Farm mechanization & its objectives. Tillage, objectives, methods, primary tillage implements, secondary tillage implements, animal drawn ploughs, construction. Types of farm implements – trailed, mounted, Field capacity , forces acting on tillage tool.	9	CO1
II	**PRIMARY AND SECONDARY TILLAGE IMPLEMENTS** Mould board plough & attachments, mould board shapes and types. Disc plough, force representation on disc, Types of disc ploughs, Subsoiler plough - Rotary plough. Cultivators - types - construction. Disc harrows, Bund former, ridger, leveller. Basin lister, Wetland preparation implements..	8	CO2
III	**SOWING AND FERTILIZING EQUIPMENT** Crop planting methods, row crop planting systems, Devices for metering seeds, furrow openers, furrow closers, types , Types of seed drills and planters, calibration-fertilizer metering devices, seed cum fertilizer drills, paddy transplanters, nursery tray machines..	7	CO3
IV	**WEEDING AND PLANT PROTECTION EQUIPMENT** Weeding equipment, hand hoe , long handled weeding tools, dryland star weeder, wetland conoweeder and rotary weeder Engine operated and tractor weeders Sprayers, types,	8	CO3

	classification, methods of atomization, spray application rate, droplet size determination, volume median diameter, numerical median diameter, drift control		
V	**HARVESTING MACHINERY** Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder combine harvesters, balers, threshers, tractor on top combine harvester, combine losses	8	CO3
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Introduction to various farm machines.
2. Field capacity and field efficiency measurement for any two machines/implements.
3. Draft & fuel consumption measurement for different implements under different soil conditions.
4. Construction details, adjustments and working of M.B. plow, disc plow and disc harrow and secondary tillage tools.
5. Construction and working of rotavators and other rotary tillers, measurement of speed & working width.
6. Working of seed-cum-fertilizer drills, planters and their calibration in field.
7. Working of trans-planters and operation; Weeding equipments and their use.
8. Study of sprayers, dusters, measurement of nozzle discharge, field capacity etc.

Text Book-

1. Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.2010.
2. Michael and Ohja. Principles of Agricultural Engineering. Jain brothers, New Delhi., 2005

Reference Books-

1. Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.
2. Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.
3. Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990.

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

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Agricultural Engineering

Semester/Year			Program		B.Tech.
Subject Category	DC	Subject Code:	**AG-1854**	Subject Name:	**Theory of Machine**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	-	-	100	3	1		4

Prerequisites:

Course Objective:

This course is focused on the study of different mechanisms and relative motion between numerous machine components.

Course Outcomes:

After completion of the course, students would be able to -

1. Interpret concepts of link, mechanisms,
2. Compute velocity and acceleration of a point or a link in Mechanism
3. Analyse Gear Mechanism
4. Illustrate Cam & follower mechanisms
5. Analyse stability of four wheelers, Two wheelers, ships and plane under the action of gyroscopic effect

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	2								
CO2	3	3	2	3								
CO3	3	2	3	3								
CO4	2	3	3	3								

CO5	2	3	3	2								

Contents:

UNITs	Descriptions	Hrs.	CO's
I	**BASICS OF** MECHANISMS: Classification of mechanisms — Basic kinematic concepts and definitions - Degree of freedom, Mobility — Kutzbach criterion, Gruebler's criterion — Grashof's Law — Kinematic inversions of four-bar chain and slider crank chains — Limit positions — Mechanical advantage — Transmission Angle —Description of some common mechanisms — Quick return mechanisms, Straight line generators, Universal Joint — rocker mechanisms.	8	CO1
II	**KINEMATICS OF LINKAGE MECHANISMS:** Displacement, velocity and acceleration analysis of simple mechanisms — Graphical method— Velocity and acceleration polygons — Velocity analysis using instantaneous centers — kinematic analysis of simple mechanisms — Coincident points — Coriolis component of Acceleration.	8	CO2
III	**GEARS:** Law of toothed gearing — Involutes and cycloidal tooth profiles —Spur Gear terminology and definitions—Gear tooth action — contact ratio — Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears	8	CO3
IV	**GEAR TRAINS** — Speed ratio, train value — Parallel axis gear trains – Epicyclic Gear Trains. **GYROSCOPE:** Gyroscopic Action in Machines: angular velocity and acceleration, gyroscopic torque/ couple; gyroscopic effect on naval ships; stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft.	8	CO4
V	**KINEMATICS OF CAM JYIECHANISMS:** Cams - Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours.	8	CO5

Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments: (if any)

Text Books-

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.

Reference Books-

1. Ghosh, A,. Mallik, A K; Theory of Mechanisms & Machines.
2. Rao J S and Dukkipati; Mechanism and Machine Theory; New Age Delhi

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. Dr. Chandra Pal Singh Name 2:
Checked and approved by	Name 1.

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---------AGRICULTURAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech					
Subject Category	DLC	Subject Code:	AG-1856	Subject Name:	Tractor and Farm Machinery Operation and Maintenance					
Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
			30	20	50			2	1

Prerequisites:

Course Objective:

The students will be introduced to the practice of different farm machinery in the field on tillage, sowing, plant protection, harvesting and threshing; care and maintenance; lubrication; fits and tolerances and replacements; adjustments of farm machines; dismantling and reassembling of a disc harrow, seed-cum fertilizer drill and sprayer, engine pumps

Course Outcomes:

After completion of the course, the student will be able to:

Practice of different farm machinery in the field & their adjustment & maintenance

Suggestive list of experiments:

1. Introduction to various systems of tractor viz. Fuel system, Lubrication system, cooling system, Electrical system, Transmission system, Steering system, Hydraulic system, Final drive system.
2. Field operation and adjustments of ploughs, harrows, cultivators, plant protection equipment, mowers and reapers.
3. Calibration of seed drill.
4. Various losses in combine & performance evaluation of thresher.
5. Maintenance after 10, 50, 100, 250, 500 and 1000 hours of operation.
6. Visit to small scale farm machinery manufacturers and their repair shops, seasonal repair of farm machinery.
7. Studies on methods of repair, maintenance and off-season storage of farm equipment
8. Opening and reassembly of disc harrows, determination and adjustment of tilt and disc angles
9. Hitching of agricultural implements and trailers
10. Economic analysis, Cost of operation and Depreciation value.

Text Book-

1. Jain, S.C. and C.R. Rai. Farm Tractor Maintenance and Repair. Standard publishers and Distributors, New Delhi, 1999.
2. Herbert L.Nichols Sr., Moving the Earth, D. Van Nostrand company Inc. Princeton, 1959.

Reference Books-

1. John A Havers and Frank W Stubbs, Hand book of Heavy Construction, McGraw – Hill book Company, New York, 1971.
2. Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.

Modes of Evaluation and Rubric
Quiz, Assignment, Mid-term exam, End term exam and Practical Viva. Rubric: End term exam. Practical: 50% Quiz and 50% Viva.
List/Links of e-learning resource

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---------AGRICULTURAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech
Subject Category	OC-I	Subject Code:	AG-1855(A)	Subject Name:	**Farm Power and Tractors**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10			100	3			3

Prerequisites:

Course Objective:

To introduce the students to the different sources of farm power and systems and working principles of tractor, power tiller, makes of tractors and power tillers.

Course Outcomes:

After completion of the course, the student will be able to:

1. Know different sources of farm power.
2. The students will be able to understand the types & working of various systems of tractor
3. The students will have the knowledge on earth moving machineries, tractor classification and tillage implements.

UNITs	Descriptions	Hrs.	CO's
I	**Sources of Power**: Sources of power on the farm - human, animal, mechanical, electrical, wind, solar and biomass; bio-fuels. Capacities and efficiencies. **TRACTORS** Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.		CO1
II	**ENGINE SYSTEMS** Valves-inlet and outlet valves – valve timing diagram. Air cleaner- exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor- electrical system.		CO2
III	**TRANSMISSION SYSTEMS** Transmission - clutch - gear box - sliding mesh - constant mesh - synchro mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.		CO2
IV	**HYDRAULIC SYSTEMS** Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal		CO2

	and lateral. Controls - visibility - operators seat.		
V	**POWER TILLER, BULLDOZER AND TRACTOR TESTING** Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components – operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers.		CO3
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Familiarization of tractor systems and controls: determination of tractor speed and slip
2. To study, working of two stroke and four stroke cycle SI & CI engines, firing interval firing order and valve timing diagram
3. To study cooling system of tractor engines
4. To study lubrication system of tractor engines
5. To study air cleaners and fuel systems of SI & CI engine
6. To study different types of governors and methods of governing
7. To study electrical system of tractors.
8. To study different types of clutches and brakes
9. To study different types of gear transmission systems calculation of speed ratio for different gears.

Text Book-

1. Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999.

Reference Books-

1. Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.
2. Domkundwar A.V. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi,1999.
3. Black, P.O. Diesel engine manual. Taraporevala Sons& Co., Mumbai, 1996.
4. Grouse, W.H. and Anglin, D.L. Automative mechanics. Macmillan McGraw- Hill, Singapore, Indian Standard Codes for Agricultural Implements Published by ISI, New Delhi, 1993.
5. Jagadeeshwar Sahay, Elements of Agricultural Engineering, Standard Publishers Co., New Delhi, 2010.

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

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---------Agriculture ENGINEERING----------

Semester/Year		V/III	Program		B. Tech
Subject Category	OC-I	Subject Code:	AG-1855(B)	Subject Name:	Open Channel Hydraulics

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10	-	-	-	3	-	-	3

Prerequisites:

Fluid Mechanics

Course Objective:

1. The objective of this course is to introduce Open Channel Flow to students, explaining the types of open channel and their behaviors, the causes and principles of such behaviors,
2. Applications open channels, enabling the students to identify the open channels.
3. To analyze, design and manage some of the types.

Course Outcomes:

After completion of the course, the student will be able to:

1. Identify hydraulic behaviours of open channels and their causes;
2. Predict the behaviour of open channels in different situations;
3. Analyse and design of artificial channels with rigid and mobile boundary.
4. Apply this knowledge in the fields like irrigation, flood control and watershed management.

UNITs	Descriptions	Hrs.	CO's
I	Basic Flow Concepts: Types of channels, classification of flows, basic equations, velocity distribution, velocity coefficients, pressure distribution.	8	CO1
II	Energy & momentum principles: Specific energy, critical flow, section factor for critical flow computation, first hydraulic exponent, computation of critical flow, specific force, specific force, channel transitions.	9	CO2
III	Uniform flow in rigid boundary channels: Shear stress distribution, velocity distribution in turbulent flow, Chezy's equation, Manning's equation, conveyance of a channel, section factor for uniform flow computation, second hydraulic exponent, computation of uniform flow.	7	CO3
IV	Uniform flow in mobile boundary channels: Incipient motion condition, shield's analysis, regimes of flow, prediction of regimes, flow resistance.	9	CO4
V	Design of channels: Rigid boundary channels, non-scouring channels, alluvial channels.	7	CO4

Guest Lectures (if any)		
Total Hours	40	

Text Book-

1. K. Subramanya, Flow in Open Channels, Tata Mc. Graw Hill, 2009 and later ed.
2. K.G. Rangaraju , Flow through Open Channels, Tata Mc. Graw Hill, 1993.
3. M.H Chaudhury, Open Channel Flow, Prentice Hall of India, 2008 and later ed..

Reference Books-

1. V.T Chow, Open Channel Hydraulics, McGraw Hill, 2009.
2. NPTEL Web Resources on Open Channel Flow/Hydraulics

Modes of Evaluation and Rubric

Quiz, Assignment, Mid term exam and End term exam.
Rubric: End term exam.

List/Links of e-learning resource

https://nptel.ac.in/courses/105/107/105107059/

https://nptel.ac.in/courses/105/103/105103096/

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---------AGRICULTURAL ENGINEERING----------

Semester/Year		V/III	Program		B.Tech
Subject Category	OC-I	Subject Code:	AG-1855 (C)	Subject Name:	**Climate Change And Adaptation**

Maximum Marks Allotted						Contact Hours			Total Credits
Theory			Practical		Total Marks				
End Sem	Mid-Sem	Quiz	End Sem	Lab-Work		L	T	P	
70	20	10			100	3	1	-	4

Prerequisites:

Course Objective:

1. To know the basics, importance of global warming
2. To know the concept of mitigation measures against global warming
3. To learn about the global warming and climate change.

Course Outcomes:

After completion of the course, the student will be able to:

1. Demonstrate an understanding of how the threats and opportunities of predicted climate change will influence specific sectors at global and regional scale
2. Critically evaluate the relative opportunities and needs for mitigation and adaptation (including vulnerability assessments) in a variety of sectoral contexts;
3. Understand and critically evaluate the scientific insights underlying the assessment reports of the IPCC, with a focus on impacts, adaptation and mitigation.

UNITs	Descriptions	Hrs.	CO's
I	**EARTH'S CLIMATE SYSTEM** Role of ozone in environment - ozone layer - ozone depleting gases - Green House Effect, Radioactive effects of Greenhouse Gases - Hydrological Cycle - Green House Gases and Global Warming – Carbon Cycle.	7	CO1
II	**ATMOSPHERE AND ITS COMPONENTS** Importance of Atmosphere - Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability - Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.	8	CO1
III	**IMPACTS OF CLIMATE CHANGE** Causes of Climate change : Change of Temperature in the environment - Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and	9	CO2

	Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions – Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.		
IV	**OBSERVED CHANGES AND ITS CAUSES** Climate change and Carbon credits- CDM- Initiatives in India- Kyoto Protocol Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC– IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India .	8	CO2,CO3
V	**CLIMATE CHANGE AND MITIGATION MEASURES** Clean Development Mechanism –Carbon Trading- examples of future Clean Technology –Biodiesel – Natural Compost – Eco-Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry –Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS) - Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation	8	CO3
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1.

Text Book-

1. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

Reference Books-

1. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge, 2006.
2. Atmospheric Science, J.M. Wallace and P.V. Hobbs, Elsevier / Academic Press 2006.
3. Jan C. van Dam, Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press, 2003.

Modes of Evaluation and Rubric

Quiz, Assignment, Mid-term exam, End term exam and Practical Viva.
Rubric: End term exam. Practical: 50% Quiz and 50% Viva.

List/Links of e-learning resource

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	