SEMESTER 3

25UAGT301	STRENGTH OF MATERIALS & THEORY OF STRUCTURES	Category	L	T	P	R	Credit	Year of Introduction
		PCC	3	1	0	0	4	2025

Preamble: This course equips students with fundamental knowledge of strength of materials and structural analysis required for the design of steel and reinforced concrete structures. It enables students to understand structural behavior under different types of loads and apply relevant IS codes for safe and economical structural design.

Prerequisite: Nil

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

CO	Course Outcomes	Knowledge Level
CO1	Describe stress, strain, elastic behaviour, and analyse axially loaded members, columns, and basic beam behaviour.	K2 Understand
CO2	Apply analytical methods to determine slopes, deflections, and internal forces in statically determinate and indeterminate beams.	K3 Apply
CO3	Apply steel structural members and connections relevant to agricultural and rural structures using IS Codes	K3 Apply
CO4	Apply IS code provisions to design basic reinforced concrete structural elements for safe and functional engineering applications.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO2
CO 1	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO 2	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO 3	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**
CO 4	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**
Avg	**3**	**2.75**	**2.75**	**1.75**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**2.75**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*	*	*	*	*
CO4	*	*	*	*	*	*	*	*	*

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment/Field visit report : 15 marks

SYLLABUS

Module 1 (12 hours)

Introduction to strength of materials; Concept of stress, strain and elastic constants. Hook's Law and Stress-Strain curve of Mild Steel. Axially loaded bars with uniform and varying cross-sections (with basic problems). Theory of columns and struts: Euler's Equation & Rankine's Equation (with basic problems). Shear Force Diagram and Bending Moment Diagram for cantilever, simply supported and overhanging beams subjected to combination of point loads and uniformly distributed loads.

Module 2 (12 hours)

Statically indeterminate structures: Slope and deflection of beams using integration techniques, Moment Area Theorems, Conjugate Beam method; Clapeyron's Three-Moment Theorem: analysis of propped beams, fixed beams and continuous beams; Analysis of beam using moment distribution method.

Module 3 (16 hours)

Types of Loads and load combinations. Specifications & use of IS code (IS 800-2007), steel table and BIS code; Design of steel structures- Connections: analysis of bolted connections and welded connections (with problems). Design concept of steel members under tension and compression, Structural failure modes in agricultural buildings and prevention. Cost-effective structural design concepts for rural development.

Module 4 (16 hours)

Design of RCC structures- specifications, use of IS code (IS 456-2000), Design of singly and doubly reinforced sections. Design of columns. Design considerations for retaining walls and silos. Structural safety of rural water supply systems.

Field Visit

Field Visits to Rural bridge / culvert site/Steel fabrication workshop for farm structures /

Greenhouse / polyhouse demonstration farm.

Text Books

1. Bansal, R. K. (2005). *A textbook of engineering mechanics*. Laxmi Publications.
2. Khurmi, R. S. (2006). *Strength of materials*. S. Chand Publishing.
3. Punmia, B. C., Jain, A. K., & Jain, A. K. (2016). *Limit state design of reinforced concrete*. Laxmi Publications.
4. Raju, N. K. (2019). *Design of reinforced concrete structures: IS 456:2000*. CBS Publishers & Distributors.

Reference Books

1. Gupta, J. K., & Gupta, S. K. (2024). *Strength of materials* (2nd ed.). Cengage India.
2. Bedi, D. S. (2023). *Strength of materials*. Khanna Publishing House.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER

(STC 2025 SCHEME)

Course Code	**25UAGT301**
Course Name	**STRENGTH OF MATERIALS & THEORY OF STRUCTURES**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A

(Answer all questions. Each question carries 3 marks)

Qn No.	**Question**	**Marks**	**CO**	**BL**
1.	Explain stress and strain and state Hooke's law.	3	CO1	L2
2.	Differentiate between Euler's and Rankine's approach to column buckling.	3	CO1	L2
3.	Explain moment area method to state how the slope at a support of a simply supported beam is obtained.	3	CO2	L2
4.	Explain Clapeyron's three-moment theorem and mention its use in continuous beams.	3	CO2	L2
5.	Explain the types of loads and load combinations considered as per IS 800-2007.	3	CO3	L2
6.	Differentiate bolted and welded connections used in steel agricultural structures.	3	CO3	L2
7.	Explain the IS 456-2000 assumptions used in design of singly reinforced sections.	3	CO4	L2
8.	Describe the design considerations for a retaining wall in a rural structure.	3	CO4	L2

Part B

(Answer any one full question from each Module. Each question carries 9 marks)

Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain the stress-strain curve of mild steel and mark its salient points.	9	CO1	L2
OR				
10	Explain how the total elongation of a bar of varying cross-section subjected to an axial tensile load is determined.	9	CO1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Apply the conjugate beam method to determine of slope and deflection of a simply supported beam carrying a central point load.	9	CO2	L3
OR				
12	Apply the moment distribution method to explain the analysis of a propped cantilever beam.	9	CO2	L3
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	Design and explain the analysis of a bolted connection for a steel tension member used in a farm structure as per IS 800-2007.	9	CO3	L3
OR				
14	Explain the design concept of steel members under compression and the structural failure modes to be prevented in agricultural buildings.	9	CO3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Apply IS 456-2000 provisions to explain the design steps of a singly reinforced concrete beam section.	9	CO4	L3
OR				
16	Apply the Design considerations for an RCC column and a silo for rural applications.	9	CO4	L3

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25UAGT302	FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS	Category	L	T	P	R	Credit	Year of Introduction
		PCC	3	1	0	0	4	2025

Preamble: This course introduces the fundamental principles of fluid statics and fluid dynamics, focusing on the behavior of fluids at rest and in motion. It emphasizes the application of fluid flow principles to engineering systems, including pipe flow, open channel flow, flow measurement, and dimensional analysis, forming a foundation for advanced studies in fluid machinery and hydraulic engineering.

Prerequisite: Nil

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

CO	Course Outcomes	Knowledge Level
CO1	Explain the properties of fluids & stability concepts of submerged and floating bodies.	K2 Understand
CO2	Describe the kinematics of fluid flow approaches	K2 Understand
CO3	Apply flow measurement techniques in irrigation pipelines	K3 Apply
CO4	Apply principles of open channel hydraulics in water distribution systems	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	1		-	-	-	-	-	3	3
CO3	3	3	2	2	2	2	-	-	-	-	-	3	3
CO4	3	3	2	3	3	2	-	-	-	-	-	3	3
Avg	3	2.8	2	2.5	2	2	-	-	-	-	-	3	3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*					
CO2	*	*	*	*		*			
CO3	*	*	*	*	*	*	*	*	
CO4	*	*	*	*	*	*	*	*	

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9

*	*	*	*	*	*	*	*	

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment/Field Visit Report : 15 marks

SYLLABUS

Module 1 (14hrs)

Properties of fluids: ideal and real fluids, units and dimensions; pressure and its measurement, Pascal's law; pressure forces on plane and curved surfaces, centre of pressure, pressure diagrams; application of hydrostatics in engineering structures. Buoyancy and floatation: Archimedes' principle, metacentre and metacentric height; conditions of floatation, stability of submerged and floating bodies.

Module 2 (14 Hrs)

Kinematics of Fluid Flow: Description of fluid motion: Lagrangian and Eulerian approaches; continuity equation for one-, two- and three-dimensional flow; path lines, streak lines and stream lines. Stream function and velocity potential, properties and applications; flow nets and their applications. Types of fluid flow, Translation, rotation, circulation and vorticity; vortex motion – free and forced vortices.

Module 3 (14 Hrs.)

Dynamics of Fluid Flow and Pipe Flow; Dynamics of fluid flow: Euler's equation and Bernoulli's theorem, assumptions, and its practical applications. Flow measurement devices and its working ; end contraction of weirs, various types of nappe. Laminar and turbulent flow in pipes; Darcy–Weisbach equation; major and minor losses; Moody's diagram; hydraulic gradient line and energy gradient line; flow through simple, compound and pipe networks; transmission of power through pipes. Flow measurement in irrigation pipelines, Water conveyance efficiency in canal systems, Automation in irrigation flow measurement.

Module 4 (14 hrs)

Open Channel Flow, Dimensional Analysis and Introduction to Fluid Machinery: Open channel hydraulics, best hydraulic section,velocity and pressure distribution in open channels; Hydraulic jump and its applications in energy dissipation structures. Discharge measurement in open channels. Dimensional analysis and similitude: Rayleigh's method and Buckingham's π-theorem; types of similarities; important dimensionless numbers. Introduction to fluid machinery: classification, energy transfer, applications in engineering systems., Flow measurement in rural water supply systems, Smart water distribution networks.

Field Visit

Field visits to Irrigation canal project site/ Minor irrigation dam / check dam/ Micro-irrigation demonstration farm/ Pump house & lift irrigation system/ Water treatment plant/ Watershed development project site/ Rural water distribution system

Text Books

1. Bansal, R. K. (2010). *A textbook of fluid mechanics and hydraulic machines*. Laxmi Publications.
2. Modi, P. N., & Seth, S. M. (2019). *Hydraulics and fluid mechanics* (22nd ed.). Standard Book House.
3. Subramanya, K. (2013). *Open channel flow* (3rd ed.). Tata McGraw-Hill Education.

Reference Books

1. Rajput, R. K. (2024). *A textbook of fluid mechanics and hydraulic machines*. S. Chand Publishing.
2. Çengel, Y. A., & Cimbala, J. M. (2020). *Fluid mechanics: Fundamentals and applications* (3rd ed.). McGraw-Hill Education.
3. Fox, R. W., McDonald, A. T., & Pritchard, P. J. (2019). *Introduction to fluid mechanics* (9th ed.). John Wiley & Sons.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER
(STC 2025 SCHEME)

Course Code	**25UAGT302**
Course Name	**FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A
(Answer all questions. Each question carries 3 marks)

Qn No.	Question	Marks	CO	BL
1.	Distinguish between ideal and real fluids with appropriate examples.	3	CO1	L2
2.	Explain Archimedes' principle and metacentric height.	3	CO1	L2
3.	Differentiate between Lagrangian and Eulerian descriptions of fluid motion.	3	CO2	L2
4.	Explain stream function and velocity potential.	3	CO2	L2
5.	Explain how discharge is measured for a venturi meter installed in an irrigation pipeline	3	CO3	L2
6.	Describe the Darcy-Weisbach equation to state how major head loss in a pipe is computed.	3	CO3	L2
7.	Explain the conditions for the best hydraulic section of a rectangular channel and derive the relationship for the most economical section.	3	CO4	L2
8.	Describe the concept of hydraulic jump to explain energy	3	CO4	L2

	dissipation in a channel.			
Part B *(Answer any one full question from each Module. Each question carries 9 marks)*				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain Pascal's law and the determination of total pressure and centre of pressure on a plane surface submerged in a liquid.	9	CO1	L2
OR				
10	Explain the conditions of stability of floating and submerged bodies with reference to metacentre.	9	CO1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Describe the continuity equation for three-dimensional flow and explain the significance of flow nets.	9	CO2	L2
OR				
12	Explain the types of fluid flow and describe vorticity, circulation and free and forced vortex motion.	9	CO2	L2
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	Apply Bernoulli's theorem to explain the working of a venturimeter for flow measurement in an irrigation pipeline.	9	CO3	L3
OR				
14	Apply Moody's diagram to determine friction losses in laminar and turbulent flow in pipes	9	CO3	L3
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Apply the principles of open channel hydraulics to derive the conditions for the best hydraulic section of a trapezoidal channel.	9	CO4	L3
OR				
16	Apply dimensional analysis to a fluid flow problem according to Buckingham's pi-theorem	9	CO4	L3

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25UAGT303	WATERSHED HYDROLOGY	Category	L	T	P	R	Credit	Year of Introduction
		PBL	3	0	0	1	4	2025

Preamble: Objective of this course to get familiarize the students with the important aspects of watershed hydrology and to impart the knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.

Prerequisite: Nil

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

CO	Course Outcomes	Knowledge Level
CO1	Explain hydrologic cycle and its various components and their behaviour in watershed	K2 Understand
CO2	Explain the runoff characteristics of a watershed and peak runoff estimation	K2 Understand
CO3	Explain watershed characteristics through geomorphological parameters and hydrograph	K2 Understand
CO4	Evaluate the natural hazards that affect agricultural land and prioritization of watershed	K5 Evaluate

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO 1	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**
CO 2	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO 3	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**3**
CO 4	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**3**
Avg	**2.75**	**2.75**	**2**	**2.25**	**2**	**2.5**	**2.5**	**-**	**-**	**-**	**-**	**2.75**	**2.25**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*		*	*	*
CO4	*	*	*	*	*	*	*	*	*

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	60	40	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance : 5 marks
Internal Examination I : 12.5 marks
Internal Examination II : 12.5 marks
Project : 30 marks

Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks
1	Project Planning and Proposal	5
2	Contribution in Progress Presentations and Question Answer Sessions	4
3	Involvement in the Project Work and Team Work	3
4	Execution and Implementation	10
5	Final Presentations	5
6	Project Quality, Innovation and Creativity	3
	Total	30

1. **Project Planning and Proposal (5 Marks)**
   - Clarity and feasibility of the project plan
   - Research and background understanding
   - Defined objectives and methodology
2. **Contribution in Progress Presentation and Question Answer Sessions (4 Marks)**

- Individual contribution to the presentation
- Effectiveness in answering questions and handling feedback

3. **Involvement in the Project Work and Team Work (3 Marks)**

- Active participation and individual contribution
- Teamwork and collaboration

4. **Execution and Implementation (10 Marks)**

- Adherence to the project timeline and milestones
- Application of theoretical knowledge and problem-solving
- Final Result

5. **Final Presentation (5 Marks)**

- Quality and clarity of the overall presentation
- Individual contribution to the presentation
- Effectiveness in answering questions

6. Project Quality, Innovation, and Creativity (3 Marks)

- Overall quality and technical excellence of the project
- Innovation and originality in the project
- Creativity in solutions and approaches

SYLLABUS

Module 1 (14 hours)

Hydrologic cycle and components, Types and Forms of precipitation, Measurement of precipitation, Estimation of mean rainfall, Estimation of missing rainfall, determining optimum rain gauge, Graphical representation of rainfall, Frequency analysis of point rainfall, Depth-area-duration curves and intensity duration- frequency relationship, Hydrologic process.

Module 2 (12 hours)

Evaporation – definition and measurement of evaporation: Evaporimeters, Evapotranspiration-factors affecting and measurement methods, Crop coefficient and pan coefficient, Runoff-factors affecting run off; Time of concentration, Methods of Run-off computation.

Module 3 (12 hours)

Hydrograph – definition, types and components: factors affecting shape of hydrograph, Methods of base flow separation, unit hydrograph theory; Steps for developing unit hydrograph, s-curve method, Instantaneous unit hydrograph, synthetic unit hydrograph, Watershed – Definition and Geomorphology of watersheds, Integrated Water Resources Management to support clean water and sanitization

Module 4 (18 hours)

Floods –definition and flood routing, Methods to reduce impacts of flood for sustainable future. Stream gauging, Flood and drought: classification, causes, Basics of Remote Sensing and GIS, Prioritization of watershed using modern tools.

Text Books

1. Raghunath, H. M. (2022). *Hydrology: Principles, analysis and design* (4th ed.). New Age International (P) Limited.
2. Subramanya, K. (2024). *Engineering hydrology* (6th ed.). Tata McGraw-Hill.
3. Suresh, R. (2019). *Watershed hydrology* (2nd ed.). Standard Publishers and Distributors.

Reference Books

1. Chow, V. T., Maidment, D. R., & Mays, L. W. (2020). *Applied hydrology* (2nd ed.). McGraw-Hill.
2. Murthy, V. V. N. (2021). *Land and water management engineering* (7th ed.). Kalyani Publishers.
3. Garg, S. K. (2023). *Irrigation engineering and hydraulic structures* (38th ed.). Khanna Publishers.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER
(STC 2025 SCHEME)

Course Code	**25UAGT303**
Course Name	**WATERSHED HYDROLOGY**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A *(Answer all questions. Each question carries 3 marks)*				
Qn No.	**Question**	**Marks**	**CO**	**BL**
1.	Explain hydrologic cycle and list its major components.	3	CO1	L2
2.	Explain how missing rainfall data at a station is estimated.	3	CO1	L2
3.	Describe evapotranspiration and state the factors affecting it.	3	CO2	L2
4.	Explain the term time of concentration in runoff computation.	3	CO2	L2
5.	Explain a unit hydrograph and state its basic assumptions.	3	CO3	L2
6.	Explain the geomorphological parameters used to characterise a watershed.	3	CO3	L2
7.	Explain the role of remote sensing and GIS in watershed prioritisation.	3	CO4	L2
8.	Describe the measures used to reduce the impact of floods for a sustainable future.	3	CO4	L2
Part B *(Answer any one full question from each Module. Each question carries 9 marks)*				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain the forms and measurement of precipitation and the methods of estimating mean rainfall over a watershed.	9	CO1	L2
OR				
10	Explain depth-area-duration curves and the intensity-duration-frequency relationship of rainfall.	9	CO1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Explain the factors affecting runoff and describe the methods of runoff computation.	9	CO2	L2
OR				
12	Explain the measurement of evaporation and evapotranspiration, including the use of crop and pan	9	CO2	L2

	coefficients.			
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	Explain the components of a hydrograph and the factors affecting its shape, and describe base flow separation.	9	CO3	L2
OR				
14	Explain the steps for developing a unit hydrograph and describe the S-curve method.	9	CO3	L2
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Evaluate the natural hazards affecting agricultural land and justify a scheme for prioritisation of watersheds using modern tools.	9	CO4	L5
OR				
16	Evaluate the structural and non-structural methods of flood routing and control for a sustainable future.	9	CO4	L5

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25UAGT304	BASIC IOT SENSORS AND DEVICES	Category	L	T	P	R	Credit	Year of Introduction
		ESC	3	1	0	0	4	2025

Preamble: This course introduces the fundamentals of Internet of Things (IoT) with a focus on basic sensors and devices used in agricultural applications. It provides foundational knowledge required for applying IoT technologies in smart agriculture and environmental monitoring.

Prerequisite: Nil

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

CO	Course Outcomes	Knowledge Level
CO1	Describe the basic components of IoT systems and their relevance in Agricultural Engineering.	K2 Understand
CO2	Describe suitable sensors for agricultural applications	K2 Understand
CO3	Explain the working of IoT devices and hardware platforms	K2 Understand
CO4	Apply IoT concepts to real-world agricultural problems	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	1	1	1	-	-	-	-	-	-	-	1	1
CO 2	3	2	2	2	3	-	-	-	-	-	-	3	2
CO 3	3	1	1	1	3	-	-	-	-	-	-	3	1
CO 4	3	3	3	2	3	2	-	-	-	-	-	3	3

Avg	**3**	**1.75**	**1.75**	**1.5**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**1.75**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*	*	*	

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	**40**	**60**	**2.5 hrs**

Continuous Internal Evaluation Pattern

Attendance : 5 marks
Continuous Assessment Test : 20 marks
Continuous Assessment Assignment / Field visit report : 15 marks

SYLLABUS

Module 1 (12 hours)

Introduction to Internet of Things (IoT): Definition, evolution, and components, IoT architecture: sensing layer, network layer, application layer, Role of sensors and actuators in IoT systems, Basic concepts of measurement, Signal types.

Module 2 (14 hours)

Temperature sensors, Humidity sensors, soil moisture sensors, Light sensors, Gas sensors (CO , NH , methane) for agricultural environments, IoT-based water quality monitoring, ultrasonic sensors, PIR sensors, Sensor characteristics, calibration, and selection criteria for agricultural use. Sensor-based pest and disease monitoring,

Module 3 (15 hours)

Introduction to microcontrollers: Arduino, ESP32, Raspberry Pi (overview), Interfacing sensors with microcontrollers, Actuators: relays, motors, solenoid valves used in agriculture, Power supply requirements and energy management in IoT devices, Basics of data acquisition and local data storage, Smart greenhouse climate control, Temperature & humidity tracking in warehouses

Module 4 (15 hours)

Basics of IoT communication protocols, Data transmission from sensors to cloud platforms (conceptual overview), Introduction to agricultural IoT systems: Smart irrigation systems, Crop

health and climate monitoring, Automated greenhouse systems, Challenges in agricultural IoT: environmental conditions, power constraints, connectivity, IoT-based precision irrigation scheduling, Smart fertigation systems, Real-time groundwater monitoring systems.

Field visit

Field visits /Industry exposure to Smart greenhouse facility/Precision farming demonstration farm/Micro-irrigation automation company/Agricultural research station with sensor networks/Cold storage facility with monitoring systems/ Meteorological observation station.

Textbooks

1. Kamal, R. (2017). *Internet of things: Architecture and design principles* (Indian ed.). McGraw-Hill Education.
2. Dixit, U., & Singh, S. (2010). *Internet of things: Concepts, techniques and applications*. Wiley India.
3. Sharma, V., & Gupta, R. (2021). *Fundamentals of IoT sensors and devices*. Khanna Publishing House.

Reference Books

1. Ghosh, S., & Ray, S. (2020). *Smart IoT sensors and agricultural monitoring systems*. CRC Press/Taylor & Francis.
2. Patil, R. S., & Kulkarni, S. S. (2022). *IoT and wireless sensor networks: Agriculture and environment applications*. Narosa Publishing House.
3. Verma, A., & Singh, B. (2021). *Embedded systems and IoT with sensor applications*. Oxford University Press

END SEMESTER EXAMINATION - MODEL QUESTION PAPER
(STC 2025 SCHEME)

Course Code	**25UAGT304**
Course Name	**BASIC IOT SENSORS AND DEVICES**
Max. Marks: 60	**Duration: 2.5 Hours**

Part A
(Answer all questions. Each question carries 3 marks)

Qn No.	Question	Marks	CO	BL
1.	Explain IoT and list its three architectural layers.	3	CO1	L2
2.	Explain the role of sensors and actuators in an IoT system.	3	CO1	L2
3.	Explain suitable sensors for monitoring soil moisture and temperature in a field.	3	CO2	L2
4.	Describe the selection criteria for gas sensors in an agricultural environment.	3	CO2	L2

5.	Explain the role of a microcontroller such as Arduino in an IoT device.	3	CO3	L2
6.	Describe how actuators like relays and solenoid valves are used in agriculture.	3	CO3	L2
7.	Describe IoT concepts to outline a smart irrigation system for a field.	3	CO4	L2
8.	Explain IoT concepts to describe an automated greenhouse monitoring setup.	3	CO4	L2
Part B *(Answer any one full question from each Module. Each question carries 9 marks)*				
Module I				
Qn No.	**Question**	**Marks**	**CO**	**BL**
9	Explain the architecture of an IoT system and the relevance of its components in Agricultural Engineering.	9	CO1	L2
OR				
10	Explain the basic concepts of measurement and the different signal types used in IoT systems.	9	CO1	L2
Module II				
Qn No.	**Question**	**Marks**	**CO**	**BL**
11	Explain the working and selection of soil moisture, temperature and humidity sensors for agricultural applications.	9	CO2	L2
OR				
12	Explain the sensors suitable for sensor-based pest and disease monitoring in crops.	9	CO2	L2
Module III				
Qn No.	**Question**	**Marks**	**CO**	**BL**
13	Explain the working of microcontroller platforms (Arduino/ESP32/Raspberry Pi) and the interfacing of sensors with them.	9	CO3	L2
OR				
14	Explain power supply requirements and energy management in IoT devices used in the field.	9	CO3	L2
Module IV				
Qn No.	**Question**	**Marks**	**CO**	**BL**
15	Apply IoT concepts to design a smart irrigation system and explain its working.	9	CO4	L3
OR				
16	Apply IoT concepts to an automated greenhouse system and explain how environmental parameters are controlled.	9	CO4	L3

25UAGL305	**FLUID MECHANICS AND HYDRAULICS LAB**	****** **Category**	**L**	**T**	**P**	**R**	**Credit**	**Year of Introduction**
		L	**0**	**0**	**3**	**0**	**2**	**2025**

Preamble: This laboratory course provides practical exposure to the fundamental principles of fluid mechanics and hydraulics through experiments. It develops the ability to measure hydraulic machine performance, and model prototype relationships relevant to irrigation and agricultural water management systems.

Prerequisite: Nil

Course Outcomes (COs)

At the end of the course students should be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the working principles of flow measuring devices, pumps and hydraulic machines.	K2 Understand
CO2	Apply fluid mechanics principles for determination of discharge, pressure, head loss, and efficiency of hydraulic systems.	K3 Apply
CO3	Apply experimental procedures to evaluate flow characteristics in pipes and open channels.	K3 Apply
CO4	Explain the concepts of similarity, non-dimensional numbers and their significance in model studies.	K2 Understand

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO4	**3**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
Avg	**3**	**2.5**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*					
CO2	*	*	*	*					
CO3	*	*	*	*					
CO4	*	*	*	*	*	*			

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration

100	**50**	**50**	**3 hrs**

List of Experiments

Expt. No.	Experiments
1	Study of manometers and pressure gauges*
2	Study of transmissibility of liquid pressure
3	Study of various types of flow*
4	Determination of meta-centric height*
5	Determination of coefficient of discharge of venturi-meter and orifice meter*
6	Determination of coefficient of friction in pipeline*
7	Determination of coefficient of discharge for notches *
8	Determination of coefficient of discharge of flow through orifice *
9	Determination of coefficient of discharge for mouth piece*
10	Determination of efficiency of hydraulic ram*
11	Measurement of velocity by current meter*
12	Study of open channel flow and determination of different roughness coefficient*
13	Study of various types of models and prototypes.
14	Study on non-dimensional constants
15	Study of various types of pumps and its components*

Minimum 12 experiments are compulsory
****Compulsory experiments***

Continuous Internal Evaluation Marks (CIE)

- Attendance : 5 marks
- Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment) : 25 marks
- Internal Examination: 20 marks

End Semester Examination Marks (ESE)

- Procedure/ Preparatory work/Design/Algorithm : 10 marks
- Conduct of experiment/ Execution of work/ troubleshooting/ Programming : 15 marks
- Result with valid inference/ Quality of Output : 10 marks
- Viva voce : 10 marks
- Record: 5 marks

Submission of Record: Students shall be allowed for the end semester examination

only upon submitting the duly certified record.

Continuous Assessment (25 Marks)

Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

Conduct of Experiments (7 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

Lab Reports and Record Keeping (6 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

Viva Voce (5 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

Result with Valid Inference/Quality of Output (10 Marks)		**Category**	**L**	**T**	**P**	**R**	**Credit**	**Year of Introduction**
25UAGL306	**STRENGTH OF MATERIALS LAB**	**PCL**	**0**	**0**	**3**	**0**	**2**	**2025**

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

Text Books

1. Fox, R. W., McDonald, A. T., & Pritchard, P. J. (2016). Fluid mechanics (9th ed.). John Wiley & Sons.
2. Çengel, Y. A., & Cimbala, J. M. (2014). Fluid mechanics: Fundamentals and applications (3rd ed.). McGraw-Hill Education.
3. Rajput, R. K. (2018). Fluid mechanics and hydraulic machines (6th ed.). S. Chand Publishing.

Reference Books

1. Kumar, D. S. (2021). Fluid mechanics and machinery (Rev. ed.). S. K. Kataria & Sons.
2. Modi, P. N., & Seth, S. M. (2019). Hydraulics and fluid mechanics (22nd ed.). Standard Book House.

Video Links (NPTEL, SWAYAM…)

- https://www.youtube.com/watch?v=LxLCJlTK4TY&t=3s
- https://www.digimat.in/nptel/courses/video/105101082/
- https://www.digimat.in/nptel/courses/video/105105203/

Preamble: This laboratory course provides practical exposure to the mechanical and physical properties of materials commonly used in agricultural structures, farm machinery, and rural

infrastructure. The course develops skills in experimental testing, interpretation of material behaviour, and assessment of engineering properties relevant to durability, safety, and performance in agricultural applications.

Prerequisite: Nil

Course Outcomes (COs)

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

CO	Course Outcomes	Knowledge Level
CO1	Compute the strength of aggregates, mortar and concrete specimens as per IS methods.	K3 Apply
CO2	Determine mechanical properties of engineering materials as per IS methods.	K3 Apply
CO3	Calculate the stiffness of engineering materials under various loading conditions.	K3 Apply
CO4	Analyze stress strain behaviour and failure characteristics of engineering materials under different loading conditions	K4 Analyze

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO2
CO 1	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO 2	**3**	**3**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO 3	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**
CO 4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**3**
Avg	**3**	**2.75**	**2.5**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**3**	**3**

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Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*	*	*	*

WKs Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	50	50	3 hrs

List of Experiments

Expt. No.	Experiments
1	Determination of aggregate toughness using the Aggregate Impact Value Test.
2	Determination of aggregate strength using Aggregate Crushing Value Test.
3	Determination of void ratio and bulk density of fine and coarse aggregates
4	Determination of standard consistency of cement.
5	Determination of 14 days and 28 days compressive strength of mortar cubes.
6	Determination of flexural behaviour of timber beam under three-point loading
7	Determination of 14 days and 28 days compressive strength of concrete cubes
8	Determination of ultimate shear strength of mild steel specimen by Double Shear test.
9	Determination of notch toughness of mild steel specimen by Izod & Charpy Impact tests.
10	Determination of material hardness using the Brinell Hardness test & Rockwell Hardness test.
11	Determination of torsional rigidity of mild steel specimen.
12	Analysis of load–deflection behaviour of closely coiled helical springs under tension.
13	Analysis of load–deflection behaviour of open coiled helical springs under compression.
14	Tensile Testing of a Mild Steel specimen to evaluate Stress–Strain behaviour and mechanical Properties

Minimum 12 experiments are compulsory

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program output.

Viva Voce (10 Marks)

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- Proficiency in answering questions related to theoretical and practical aspects of the subject.

Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

Text Books

1. Junarkar, S. B. (2001). *Mechanics of structures* (Vol. 1). Charotar Publishing House.
2. Khurmi, R. S. (2006). *Strength of materials*. S. Chand Publishing.
3. Lehri, R. S., & Lehri, R. S. (2006). *Strength of materials*. S. K. Kataria & Sons.

Reference Books

1. Bedi, D. S. (2019). *Strength of materials* (6th ed.). Khanna Publishing House.
2. Gupta, J. K., & Gupta, S. K. (2024). *Strength of materials* (2nd ed.). Cengage India.

Video Links (NPTEL, SWAYAM…)

- *https://www.youtube.com/watch?v=vUe8u9htgUY*
- *https://www.youtube.com/watch?v=G1XG3wsEQW8*
- *https://www.youtube.com/watch?v=OKRuvh7kVlQ*
- *https://www.youtube.com/watch?v=Z0VnOkOeK8U*

SUSTAINABLE DEVELOPMENT GOALS MAPPING - SEMESTER III

SEMESTER III	SUSTAINABLE DEVELOPMENT GOALS																
Course Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25UMCT301				✓					✓		✓						
25UAGT301				✓		✓			✓		✓		✓				
25UAGT302				✓		✓	✓		✓								
25UAGT303				✓		✓							✓		✓		
25UAGT304				✓		✓			✓			✓	✓				
25UHUT001	✓			✓				✓									
25UHUT002				✓		✓					✓	✓	✓				
25UAGL305				✓		✓	✓		✓								
25UAGL306				✓					✓		✓						