B. Tech with

HONORS

in

CIVIL ENGINEERING

Academic Regulations, Course Structure and Syllabus

Effective from 2023-24 admitted batches

Offered by

Department of Civil Engineering

KSRM College of Engineering (A) – Kadapa

(Approved by AICTE, Accredited by NAAC with A+ Grade and NBA and Affiliated to JNTUA, Anantapuramu)

ELIGIBILITY / REGISTRATION / AWARD OF HONORS

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The program is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B.Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) Those students with **at least 7.0 CGPA without any course backlogs up to III Semester in the major degree are only eligible to register for Honor degree**.

iii) A student shall earn **additional 18 credits for award of Honors** from same branch / department / discipline registered for major degree. This is in addition to 163 credits by a regular student and 123 Credits by a Lateral Entry student for the award of Major degree.

iv) A student is permitted to register for Honors in IV Semester after the results of III Semester are declared. Students shall register and pass in all the courses prescribed and being offered from V semester under the respective Honor degree.

v) Students have to attend classwork for courses under Honor degree beyond regular academic hours meant for major degree. Students can also undergo the courses under Honor through any proctored online platforms with the prior approval of the BoS Chairman and the HoD of the respective department offering Honor degree.

vi) The attendance for the registered courses under Honors and regular courses offered for Major degree in a Semester will be considered separately.

vii) A student shall have an aggregate of 75% attendance in all courses registered under Honors in that particular semester to become eligible for attending Semester-End examinations.

viii) The registration for the Honor will be cancelled, if the student is detained due to lack of attendance in Major,

ix) The registration for the Honor will be cancelled, if the student fails in any course of either Honor / Major in any semester from V to VIII Semester.

x) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) will be awarded for Honors degree program.

xi) A separate grade sheet will be issued for the Honor degree courses semester-wise.

xii) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra.

xiii) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical

Engineering.

xiv) There shall be a minimum enrolment of 20% OR 20 enrollments from the list of eligible students to offer Honors program.

xv) There is no fee for registration of courses for Honors program offered.

xvi) A student can register for either Minor / Honor but not both.

xvii) Student shall submit an application for either Minor / Honor at least one week before the commencement of the V Semester.

HONORS PROGRAMS OFFERED

Offering Department	Title	Who can Register
Civil Engineering	Civil Engineering	B.Tech. CE
	Tunnel Engineering	
	Interior Design	
Mechanical Engineering	Mechanical Engineering	B.Tech. ME
Electrical and Electronics Engineering	Electric Vehicles	B.Tech. EEE
Electronics and Communication Engineering	VLSI	B.Tech. ECE
	Embedded Systems and IoT	
Computer Science and Engineering	Computer Science and Engineering	B.Tech. CSE, B.Tech. AIML, B.Tech. CSE(DS), B.Tech. CSE(AIML)
	Artificial Intelligence and Machine Learning	
	Data Science	
	CSE-Artificial Intelligence and Machine Learning	

COURSE STRUCTURE

for

HONORS

in

CIVIL ENGINEERING

S.No	COURSE CODE	COURSE TITLE	Semester Offered	L	T	P	IM	EM	CR
1	2301571H	Construction Site Safety Management	V	3	0	0	30	70	3
2	2301572H	Quality Control and Assurance in Construction	V	3	0	0	30	70	3
3	2301671H	Bridge Engineering	VI	3	0	0	30	70	3
4	2301672H	Repair and Rehabilitation of Structures	VI	3	0	0	30	70	3
5	2301771H	Sustainable Construction Methods	VII	3	0	0	30	70	3
6	2301772H	Applied Project Work	VII	0	0	6	60	140	3
Total				**15**	**0**	**6**	**210**	**490**	**18**

2301571H	HONORS IN CIVIL ENGINEERING CONSTRUCTION SITE SAFETY MANAGEMENT (CE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Basic Civil and Mechanical Engineering

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Prepare QAQC plan for a construction project and understand quality transition processes.
CO2. Apply quality assurance tools and quality control techniques with national and international standards of construction safety.
CO3. Implement safety concepts, safety principles and safety requirements to construction projects.
CO4. Analyze and evaluate workplace occupational safety and health hazards and develop prevention strategies.
CO5. Design comprehensive safety management systems for construction projects.

SYLLABUS:

UNIT - I: INTRODUCTION TO QUALITY MANAGEMENT (08 Periods)

Introduction to quality concepts, importance of quality in construction industry, quality transition processes - quality control and inspection, quality assurance, total quality management. Evolution of quality management in construction sector, quality culture development, cost of quality, quality objectives and targets.

UNIT - II: QUALITY CONTROL IN CONSTRUCTION (08 Periods)

Planning and control of quality during design of structures, tools and techniques for quality management, inspection of materials and machinery. Quality control charts, statistical process control, acceptance sampling, non-destructive testing methods, quality documentation and record keeping.

UNIT - III: QUALITY ASSURANCE SYSTEMS (10 Periods)

Quality assurance in construction projects, systems quality management, quality standards/codes in design and construction (ISO:9000, ISO:14000). Quality management systems implementation, auditing procedures, certification processes, continuous improvement methodologies.

UNIT - IV: TOTAL QUALITY MANAGEMENT AND SAFETY INTRODUCTION (08 Periods)

Total quality management (TQM) - principles, tools and techniques, implementation strategies. Introduction to construction safety, safety and health programs in construction industry, planning for safety provisions, analysis of construction hazards and accidents, safety culture development.

UNIT - V: CONSTRUCTION HAZARDS AND SAFETY MANAGEMENT

(09 Periods)

Construction hazards identification and safety guidelines, prevention techniques for construction accidents, site management with regard to safety recommendations, training for safety awareness and implementation, construction safety and health manual development, emergency response planning, safety performance monitoring.

Total Periods: 43

TEXT BOOKS:

T1. B. G. Dale, Managing Quality, 4th Edition, Blackwell Publishing, Oxford, 2003. ISBN-13: 978-0631236146.

T2. D. Reese and J. V. Eidson, Handbook of OSHA Construction Safety and Health, 2nd Edition, CRC Press, Boca Raton, 2006.

REFERENCE BOOKS:

R1. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern Construction Management, 6th Edition, Blackwell Publishing, Oxford, 2006. ISBN: 978-0-470-67217-4.

R2. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction Management Fundamentals, 2nd Edition, McGraw Hill, New York, 2008. ISBN-13: 978-0073401041.

R3. S. J. Holt, Principles of Construction Safety, Blackwell Publishing, Oxford, 2008. ISBN: 978-0-470-69052-9.

R4. Rumane, Abdul R., Quality Management in Construction Projects, CRC Press. ISBN: 978-1-4396-3876-6.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ce16/preview

2301572H	HONORS IN CIVIL ENGINEERING QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION (CE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Building Planning and Drawing

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Explain the core concepts, dimensions, and methods involved in construction quality management.
CO2. Apply knowledge of ISO 9000 and other quality system standards in developing and implementing construction quality systems.
CO3. Demonstrate the ability to develop a quality plan, incorporating TQM principles and quality function deployment in construction.
CO4. Analyze and apply appropriate quality assurance and control techniques, including sampling and reliability prediction in construction processes.
CO5. Evaluate and implement quality improvement techniques such as value engineering, Kaizen, and life cycle costing to enhance construction project outcomes.

SYLLABUS:

UNIT - I: QUALITY MANAGEMENT (09 Periods)

Introduction, Definitions and objectives, Dimensions of quality, Factors influencing construction quality, Responsibilities and authority, Methods to improve quality, Quality Process, Quality plan, Quality Management Guidelines, Quality circles.

UNIT - II: QUALITY SYSTEMS (09 Periods)

Introduction, History of standards, Quality system standard, ISO 9000 family of standards, Requirements, Preparing Quality System Documents, Quality related training, Implementing a Quality system, Third-party Certification, Emission Norms, BS Norms.

UNIT - III: QUALITY PLANNING (09 Periods)

Quality Policy, Objectives and methods in the Construction industry – Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – TQM – Traditional approach vs. Modern approach – Principles of TQM - Taguchi's concept of quality – Quality function deployment - Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

UNIT - IV: QUALITY ASSURANCE AND CONTROL (09 Periods)

Objectives – Regularity agent, owner, design, contract, and construction-oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality

– Appraisals – Sampling techniques – Sampling plan – Sampling Terms – AQL, LTPD, AOL - Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction – Failure rate – Mean time to failure – Mean time to repair – Mean time between failures.

UNIT - V: QUALITY IMPROVEMENT TECHNIQUES (09 Periods)

Selection of new materials – Influence of drawings, detailing, specification, standardization – Bid preparation – Construction activity, environmental safety, social and environmental factors – Natural causes and speed of construction – Life cycle costing – Kaizen - Value engineering and value analysis.

Total Periods: 45

TEXT BOOKS:

T1. ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Hutchins. G, Oliver Wight Publications, 1993.

T2. Construction Inspection Handbook – TQM, James, J.O' Brian, Van Nostrand, Springer, 2012.

T3. ISO 9000 Practices in construction, KB Rajoria, Deepak Naryan, Deepak Gupta, CBS Publishers, 2022.

REFERENCE BOOKS:

R1. Quality Planning and Analysis, Juran Frank, J.M. and Gryna, F.M., McGraw Hill, 2001.

R2. Quality Improvement Techniques in Construction, Steven McCabe, CRC Press, 2014.

2301671H	HONORS IN CIVIL ENGINEERING BRIDGE ENGINEERING (CE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Structural Analysis, Highway Engineering and Reinforced Concrete Design

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Know the site selection parameters and various loads on bridge structures.
CO2. Analyze and design box culverts under classified loads.
CO3. Analyze and design deck slab bridges according to IRC codes.
CO4. Analyze and design T-beam bridges under IRC loadings.
CO5. Understand the design principles and learn stability aspects of piers, abutments, and bridge bearings.

SYLLABUS:

UNIT - I: INTRODUCTION (08 Periods)

Importance of Site Investigation in Bridge Design – Highway Bridge Loading Standards – Impact Factor – Railway Bridge Loading Standards (B.G & M G Bridges) – Various Loads in Bridges.

UNIT - II: DESIGN OF BOX CULVERT (08 Periods)

General Aspects – Design Loads – Design of Box Culvert Subjected to R C Class AA Tracked Vehicles only.

UNIT - III: DESIGN OF DECK SLAB BRIDGE (08 Periods)

General Features – Effective Width Method of Analysis; Design of Deck Slab Bridge (Simply Supported) subjected to Class AA Tracked Vehicles only.

UNIT - IV: DESIGN OF T-BEAM BRIDGE (08 Periods)

General Features – Design of Interior Panel of Slab – Pigeaud's Method – Design of a T-Beam Bridge Subjected to Class AA Tracked Vehicles only.

UNIT - V: PIERS, ABUTMENTS AND BRIDGE BEARINGS (10 Periods)

General Features – Bed Block – Material Piers & Abutments – Types of Piers – Forces Acting on the Piers – Stability Analysis of Piers – General Features of Abutments – Forces Acting on Abutments – Stability Analysis of Abutments – Types of Wing Walls – Approaches – Types of Bridge Foundations (Excluding Design).Bridge

Bearings:General Features – Types of Bearings – Design Principles of Rocker & Roller Bearings – Design of Steel Rocker Bearings – Design of Elastomeric Pad Bearings.

Total Periods: 45

TEXT BOOKS:

T1. S. Ponnuswamy, Bridge Engineering, Tata McGraw-Hill Education, 2nd Edition, 2013.

T2. N. Krishna Raju, Design of Bridges, Oxford & IBH Publishing Co., 4th Edition, 2008.

T3. V.N. Vazirani, M.M. Ratwani and M.G. Aswani, Design of Concrete Bridges, Khanna Publishers, 1st Edition, 1995.

T4. B.C. Punmia, Jain & Jain, Design of RC Structures, Laxmi Publications, 16th Edition, 2020.

REFERENCE BOOKS:

R1. IS 800-2007, Indian Standard Code of Practice for General Construction in Steel, Bureau of Indian Standards, New Delhi.

R2. IS 456-2000, Indian Standard Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards, New Delhi.

R3. IRC 6-2000, Standard Specifications and Code of Practice for Different Types of Loadings Acting on the Bridge Structure, The Indian Roads Congress, New Delhi.

R4. IRC 22-2000, Standard Specifications and Code of Practice for Road Bridges and Different Materials used in Bridge Structures and Reinforcement Details, The Indian Road Congress, New Delhi.

R5. IRC 24-2000, Standard Specifications and Code of Practice for Permissible Bending Stresses in Steel and its Properties, The Indian Road Congress, New Delhi.

R6. IRC 83-2000, Standard Specifications and Code of Practice for Different Types of Bridge Bearings used in the Bridges and its Detailed Specifications, The Indian Road Congress, New Delhi.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_ce63/preview

2301672H	HONORS IN CIVIL ENGINEERING REPAIR AND REHABILITATION OF STRUCTURES (CE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Concrete Technology

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Understand the cause of deterioration of concrete structures.
CO2. Able to assess the damage for different type of structures.
CO3. Summarize the principles of repair and rehabilitation of structures.
CO4. Recognize ideal material for different repair and retrofitting technique.
CO5. Know the artificial polymers and rust eliminators used for retrofitting works.

SYLLABUS:

UNIT - I: INTRODUCTION TO REPAIR AND REHABILITATION **(08 Periods)**

Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.

UNIT - II: DAMAGE ASSESSMENT **(08 Periods)**

Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems.

UNIT - III: INFLUENCE ON SERVICEABILITY AND DURABILIT **(08 Periods)**

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.

UNIT - IV: MAINTENANCE AND RETROFITTING TECHNIQUE **(08 Periods)**

Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique, near surface mounted (NSM) technique, External post- tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building

UNIT - V: MATERIALS FOR REPAIR AND RETROFITTING (08 Periods)

Artificial fibre reinforced polymer like CFRP, GFRP, AFRP and natural fibre like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Total Periods: 45

TEXT BOOKS:

T1. Deterioration, Maintenance and Repair of Structures, Sidney M. Johnson, McGraw-Hill Education, 1995, First Edition.

T2. Concrete Structures – Materials, Maintenance and Repair, Denison Campbell Allen and Harold Roper, Longman Scientific and Technical, 2001, Second Edition.

REFERENCE BOOKS:

R1. Repair of Concrete Structures, R.T. Allen and S.C. Edwards, Blakie and Sons, 1992, First Edition.

R2. Learning from Failures: Deficiencies in Design, Construction and Service, Raiker R.N., R&D Center (SDCPL), 2005, First Edition.

R3. Concrete Technology – Theory and Practice, M.S. Shetty, S. Chand & Co. Ltd., New Delhi, 2019, Eighth Edition.

WEB RESOURCES:

1. https://nptel.ac.in/courses/105106202

2301771H	HONORS IN CIVIL ENGINEERING SUSTAINABLE CONSTRUCTION METHODS (CE)	L	T	P	C
		3	0	0	3

Pre-Requisites: Basic Civil and Mechanical Engineering

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Explain the principles of sustainability and green building design, and analyze the influence of climate, thermal, visual, and acoustic comfort on sustainable building performance.

CO2. Apply resource-efficient strategies for energy and water conservation, and evaluate waste management practices suitable for residential, commercial, and healthcare buildings.

CO3. Assess sustainable site development strategies and recommend material resource management approaches that minimize environmental impacts and promote reuse, recycling, and renewability.

CO4. Analyze the sustainability potential of modern and alternative construction materials, technologies, and systems for reducing carbon emissions and enhancing long-term building performance.

CO5. Demonstrate knowledge of green project management phases, perform life cycle assessment (LCA), and interpret sustainability rating systems such as LEED, BREEAM, IGBC, and GRIHA.

SYLLABUS:

UNIT - I: INTRODUCTION TO SUSTAINABILITY, CLIMATOLOGY AND COMFORT IN BUILDINGS (9 Periods)

Overview of Sustainability and Green buildings, Selection of site – Preservation and Planning. Basics of climatology, Influence of climate on buildings, Thermal comfort – Strategies for Thermal comfort. Visual comfort –Enhancement strategies for Daylighting and Artificial lighting. Building Acoustics – defects and prevention of sound transmission.

UNIT - II: RESOURCE AND WASTE MANAGEMENT IN BUILDING (10 Periods)

Energy efficiency –Energy efficiency in building envelope, energy simulation, Energy management system –lighting and renewable energy and Energy Audit. Water Efficiency –Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse, Water efficient landscape system. Waste management –Types of waste and their treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, and healthcare facilities.

UNIT - III: SUSTAINABLE SITE PLANNING AND RESOURCE MANAGEMENT (9 Periods)

Impacts of the built environment on the natural environment. Site development- site selection, urban heat island, Public Transport, vegetation, development footprint, storm water runoff, solar reflectance index. Materials and Resources- segregation, recycling, reduction in waste, reuse of materials and building, renewability. Features of sustainable building materials and sustainable alternatives.

UNIT - IV: SUSTAINABLE MATERIALS AND TECHNOLOGIES IN CONSTRUCTION (9 Periods)

Sustainability of steel reinforcement and structural steel. Building blocks – different types. Wood-plastic composites, Engineered lumber, Bio-based products, Construction and Demolition – waste management. Design for deconstruction. Cement and carbon emissions, Alternative fuel for cements, alternative cements and cementitious material. Sustainable concrete construction – recycled materials, reducing cement content. Smart materials and technologies – Permeable concrete, cool concrete, UHPC, use of PCM.

UNIT - V: GREEN PROJECT MANAGEMENT AND LIFE CYCLE ASSESSMENT OF BUILDINGS (08 Periods)

Green building evolution and Different phases of green building project management. Life cycle assessment and its types –Modelling and Analysis, Greenhouse gas emission Sustainability rating systems: Green building rating systems-LEED, BREEAM and others, Indian Green building rating systems –IGBC & GRIHA, IGBC criteria for certification.

Total Periods: 45

TEXT BOOKS:

T1. Mike Montoya, Green Building Fundamentals: Practical Guide to Understanding and Applying Fundamental Sustainable Construction Practices and the LEED System, Pearson Publishers, 2010, 2 nd edition.

T2. Gajanan M. Sabnis, Green Building with Concrete: Sustainable Design and Construction, CRC Press, 2015.

T3. Sustainable Building Design Manual- Volume II, Published by TERI, New Delhi, 2009.

REFERENCE BOOKS:

R1. Kibert, C.J., Sustainable Construction: Green Building Design and Delivery, Wiley, 2022.

R2. Steven V. Szokolay, Introduction to Architectural Science – The Basis of Sustainable Design, Routledge, 2014.

R3. Gajanan M. Sabnis, Green Building with Concrete: Sustainable Design and

Construction, CRC Press, 2015.

R4. Dejan Mumovic and Mat Santamouris (Eds), A Handbook of Sustainable Building Design and Engineering, CRC Press, 2018.

R5. Osman Attmann, Green Architecture: Advanced Technologies and Materials, McGraw-Hill, 2010.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc19_ce40/preview.
2. https://onlinecourses.nptel.ac.in/noc22_ar12/preview.

2301772H	HONORS IN CIVIL ENGINEERING APPLIED PROJECT WORK (CE)	L	T	P	C
		0	0	6	3

Pre-Requisites: Basic knowledge in the respective engineering department/section

Course Outcomes:

On successful completion of the course, student will be able to

CO1. Apply core engineering knowledge to identify and define a suitable project topic in the field of civil engineering.
CO2. Analyze project requirements and constraints to formulate clear objectives and specifications.
CO3. Develop and execute a project plan using appropriate conventional techniques and modern engineering tools.
CO4. Demonstrate professional skills and confidence to undertake independent or team-based engineering tasks effectively.
CO5. Prepare and present comprehensive technical documentation and communicate project findings clearly and professionally.

The Honors Degree Project Work in Civil Engineering is a comprehensive and application-oriented component undertaken during the eighth semester. It enables students to apply theoretical knowledge and practical skills to real-world challenges through a design-based, experimental, field surveying, or computer-oriented project in any area of Civil Engineering or an allied domain. Students will work in groups under the supervision of a faculty guide. The internal assessment will be conducted through three progress seminars evaluated by a departmental review committee. For each review, the group must submit a six to ten-page typed report summarizing the progress of the work carried out. The final evaluation will be conducted by an examination panel comprising both internal and external faculty members specialized in various fields of Civil Engineering. Each group is required to present their completed project work to the panel for external assessment. Upon completion, a final project report signed by the faculty guide must be submitted. The Head of the Department will certify the reports after verification. Students are required to submit three hard copies of the final report—one copy to the respective faculty guide, one to the departmental library, and one to the college central library. This project work provides students with an opportunity to demonstrate their ability to address complex engineering problems, develop innovative solutions, manage a project effectively, and communicate technical outcomes professionally.