

جامعة الملك خالد
KING KHALID UNIVERSITY



College of Engineering – King Khalid University

Master of Science in Construction Project Management (CPM)

MSc. CPM Program Study Plan

Study Plan Structure

Program Structure		No. of Courses	Credit Hours	Percentage
Course	Required	6	18	60
	Elective	2	6	20
Graduation Project (if any)		--	--	--
Thesis (if any)		1	6	20
Field Experience (if any)		--	--	--
Others (.....)		--	--	--
Total		9	30	100

Program Courses:

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours
Level 1	CE781	Construction Planning and Control	Required	NA	3
	CE782	Quality Project Management	Required	NA	3
	CE783	Research Methodology	Required	NA	3
Level 2	CE784	Construction Contracts and Procurement	Required	NA	3
	CE785	Risk management in construction	Required	NA	3
	CE786	Project Financial Management	Required	NA	3
Level 3	CE799	Master's thesis	Required	NA	3
	CEXXX	Elective 1	Elective	NA	3
	CEXXX	Elective 2	Elective	NA	3
Level 4	CE799	Master's thesis	Required	NA	3

Elective 1

Choose one course among the list below

Course Code	Course Title	Pre-Requisite	Credit Hours				Contact Hours	University/College Requirement	Core/ Elective
			Theoretical	Tutorial	Exercises	Total			
CE 787	Computer applications in construction		2	1	--	3	4	--	Elective
CE 788	Value Engineering		3	-	-	3			Elective
CE 789	Infrastructure Development and Management		3	--	--	3	3	--	Elective

Elective 2

Choose one course among the list below

Course Code	Course Title	Pre-Requisite	Credit Hours				Contact Hours	University/College Requirement	Core/ Elective
			Theoretical	Tutorial	Exercises	Total			
CE 790	Quality and Safety in Construction		3	--	--	3	3	--	Elective
CE 791	Sustainable Materials and Green Buildings		3	--	--	3	3	--	Elective
CE 792	Building Services and Maintenance Management		3	--	--	3	3	--	Elective
CE 793	Construction Practices and Equipment		3	--	--	3	3	--	Elective

Descriptions of MSc. CPM Courses

Course Title	Construction planning and control	Coordinator			
Course Code	CE781	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		1/1	
Course Objective: To acquire knowledge about the fundamentals of construction planning and control and use management tools to complete projects in time with required quality and within budget and to estimate the duration of the project and apply deterministic and probabilistic project planning techniques.					
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentation)					
Expected Course Learning Outcome (CLOs):					
Knowledge To define the basics of project management					
Skills - To use the management tools for completion of project in time with required quality and within budget - To estimate duration of the project and perform Network analysis for project management - To apply Time-Cost Trade-off (Crashing) techniques - To monitor and control projects - To manage the resources and apply the uncertainty in project schedules - To decide the appropriate method for planning and control the projects					
Value: Demonstrate ethical responsibility and professional integrity in managing project schedules, resources, and stakeholder interactions with transparency and accountability.					
Course Contents:					
Unit 1: Introduction to Project Planning and Control		Introduction; Management approaches; Project stakeholders; Project management; Construction Life cycle; Planning; Scheduling; Monitoring and control			
Unit 2: Time Management, Work Breakdown Structure, Gantt Charts		Time Management overview; Basics of work Breakdown structure; Tools for time management; Gantt/bar chart history, representation, process Monitoring; Develop a bar chart (Exercise); Bar charts for resource usage –Pros and Cons			
Unit 3: Duration Estimation, Network Representation and Analysis		Duration Estimation; Factors Influencing Productivity; Piling Activity; Summary of Key Topics; Types of Networks and Techniques			
Unit 4: Time-Cost Trade-Off (Crashing)		Fast-Tracking vs Crashing; Relationship between activity direct cost and activity duration; Time-Cost Trade-Off; Time-Cost Trade-Off: Class Exercise; Time-Cost Trade-Off: Problem,			

	Tabulation Approach; Incorporating Factors such as Bonus and Penalty
Unit 5: Resources scheduling	Resources definition; Resource aggregation or Resource loading; Problems Associated with Resources; Methods for Resolving Resources conflicts (Problems): (Resource leveling , Resource Scheduling)
Unit 6: Precedence Diagramming Method (PDM), Project Monitoring & Control	Introduction to Precedence Diagramming Method (PDM); PDM Network Representation and its Issues, Network Calculation; PDM – Problem; Issues in PDM, Negative Lags; PDM - Analysis with Non-continuous Duration, Floats; Defining Relationship (based on Construction Method) - Simple Shed; Project Monitoring and Control - Typical Project Time Monitoring Process; Project Control Process, Daily Progress Report, Macro Level Update; Application: Two Span Bridge - ES Schedule
Unit 7: Project Monitoring and Control (Earned Value Concepts) and Uncertainty in Project Schedule (PERT)	Introduction to Precedence Diagramming Method (PDM); Review of Key Issues in Project Monitoring, Earned Value Concept Through Examples; Basic Earned Value Definitions & Terminology, Summary; Uncertainty in Project Schedules; PERT Background & Assumptions, Stepwise Procedure; PERT Example Problem, Summary Lesson
Textbook (s): - Saleh Mubarak, Construction Project Scheduling and Control, Wiley, 2019. - Clifford Schexnayder, Robert L. Peurifoy, Robert Schmitt, “Construction planning, equipment & Methods”, McGraw Hill, 9th Edition, 2018 - Meredith, Jack R, and Scott M Shafer. Project Management: A Strategic Managerial Approach. Eleventh edition. Hoboken, NJ: Wiley, 2022.	
Reference Book (s): - Albert Lester, Project Management, Planning and Control: Managing Engineering, 2006, ISBN: 9780081020203 - Robert Peurifoy and Clifford J. Schexnayder and Aviad Shapira and Robert Schmitt, “Construction planning, equipment & Methods”, McGraw Hill, 8th Edition, 2010. - Richard Clough, "Construction Contracting: A Practical Guide to Company Management", Wiley; 7th Edition, 2005.	
Mode of Evaluation: - Assignments, reports/presentations (20 %) - Quizzes (20%) - Midterm exam (30 %) - Final Exam. (30 %)	

Course Title	Quality Project Management	Coordinator	
Course Code	CE782	Credit Hrs.	3
Prerequisites	NIL	Level/Year	1/1
Course Objective: • Apply Construction Project Management skills successfully in the construction industry. • Apply technical skills and knowledge in mathematics, science, construction, and technology in support of planning, analyzing, and solving construction problems.			
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentation)			
Expected Course Learning Outcome (CLOs):			
Knowledge • Explain the principles and components involved in planning project quality, including quality characteristics, policies, standards, and the benefits of various planning tools and techniques. • Define quality assurance and its role in project management, including QA tools, techniques, and the importance of QA audits and change control processes.			
Skill • Implement quality assurance practices by performing measurement analysis, conducting QA audits, and evaluating QA capabilities to ensure adherence to project quality standards. • Apply quality control techniques to monitor and control project quality, utilizing tools such as cause-and-effect diagrams and statistical sampling to ensure product or process quality. • Design and implement a quality improvement plan that incorporates steps for continuous improvement, evaluates the cost of quality, and employs leadership strategies to drive enhancements in project outcomes.			
Value • Recognize the importance of quality management in achieving project success and delivering value to stakeholders. • Engage in lifelong learning and professional development in the field of construction project management			
Course Contents:			
Unit 1: The Concept and Nature of Project Quality Management:	The Concept and Nature of Project Quality Management: Evolution of Quality and Its Contemporary Application to Projects, Key Processes of Project Quality Management, project and its Characteristics, definition of quality, Quality and the Constraints, Quality Management for Projects, Features and purpose of Quality Management		
Unit II: Planning Project Quality	Quality characteristics; Quality Policy; Project quality standards; Prioritization; Benefits/Cost Analysis; Benchmarking; Flow Charting; Process Mapping; Quality Management Plan;		

	Operational Definitions; Planning checklists; Output of quality planning
Unit III: Quality Assurance	Quality Assurance definitions; Measurement Analysis of Quality Controls; QA Tools and Techniques; Quality Assurance Audits; Investigating QA capabilities; QA and change control; QA outputs
Unit IV: Quality Control	Tools and techniques of Quality Control; Pareto analysis; Statistical sampling; Six Sigma; Quality control charts; Testing; Peer Reviews; The Cause-and-Effect Diagram; Outputs of quality control
Unit V: Quality Improvement	Steps of quality improvement; Cost of Quality; Leadership; Maturity Models; Continuous Improvement
Textbooks: • Tang, S.L., Ahmed, S.M., Aoieong, Raymond T. and Poon, S.W., Construction quality management, Hong Kong University Press, Hong Kong, 2017. • Tim Howarth, David Greenwood, Construction Quality Management: Principles and Practice, Routledge, 2017.	
Reference Book (s): • Barcus. S.W and Wilkinson.J.V. “Handbook of Management Consulting Services”, McGraw Hill, New York, 2006	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Research Methodology	Coordinator	
Course Code	CE783	Credit Hrs.	3
Prerequisites	NIL	Level/Year	1/1
Course Objective: • Understanding and applying the elements of good research design for Civil Engineers • Learn to focus on a research problem using scientific methods · • Learn methods to devise and design an experimentation set-up · • Learn proper design of field data collection and experiments, collection and analysis of data (in-situ and experimental)· • Learn parameter estimation and related modelling methods of stochastic data			
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentations)			
Expected Course Learning Outcome (CLOs):			
Knowledge • In depth and understanding specialized research principles, concepts and methodologies in terms of identifying the research problem, collecting relevant data pertaining to the problem, to carry out the research and writing research papers/thesis			
Skill • Interpret the critically assess existing theories, models, methods and results, both qualitatively and quantitatively, within a broad engineering and physical science framework. • Evaluate the statistical data in a research-based study • Use the techniques, skills and tools necessary for engineering practices • Demonstrate and communicate effectively and professionally and formulate sound arguments, both in writing and by means of presentations, using appropriate technical language. • Identify the correct use of literature available in a chosen field of research			
Value • Adhere to ethical issues in research work in an informed and reasoned manner with their peers and apply an ethical approach to all work. • Commit to continuous learning and professional growth in research and project management within the field of construction.			
Course Contents:			
Unit 1: Introduction to Research:	Meaning of research, types of research, process of research, Sources of research problem, Criteria / Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, formulation of research hypotheses. Search for causation.		
Unit II: Developing a Research Proposal:	Format of research proposal, Individual research proposal, Institutional research proposal, Significance, objectives,		

	methodology, Funding for the proposal, Different funding agencies, Framework for the planning.
Unit III: Literature survey:	Definition of literature and literature survey, need of literature survey, sources of literature, elements and objectives of literature survey, styles of literature survey, and strategies of literature survey. <i>Data collection, Measuring, Sampling and Scaling:</i> Classification of data, benefits and drawbacks of data, evaluation of data, qualitative methods of data collection, methods of qualitative research, Sampling, sample size, sampling strategy, attitude measurement and scaling, types of measurements, criteria of good measurements, classification of scales.
Unit IV: Preliminary data analysis:	Testing of hypothesis- concepts and testing, analysis of variance techniques, introduction to non- parametric tests. Validity and reliability, Approaches to qualitative and quantitative data analysis. <i>Advanced data analysis techniques:</i> Correlation and regression analysis, Introduction to factor analysis, discriminant analysis, cluster analysis, multidimensional scaling, Descriptive statistics, Inferential statistics, Multidimensional measurement and factor analysis
Unit V: Report writing:	Need of effective documentation, importance of report writing, types of reports, report structure, report formulation, Plagiarism. <i>Presentation of research:</i> Research briefing, presentation styles, impact of presentation, elements of effective presentation, Writing of research paper, presenting and publishing paper, patent procedure.
Textbooks • Kothari, CR. (2019). Research Methodology: Methods and Techniques, 4th Edison. New age international Publishers. ISBN (13): 978-81-224-2488-1 • Boulton, G. C., & Bradley, M. P. (2022). <i>Applied Research Methods in Construction</i> (2nd ed.). Routledge. ISBN: 978-0367338924. • Cohen, L., Manion, L., MArrison, K. (2007). Research Methods in Education, 6th Edison. Routledge (Taylor & Francis Group) ISBN-13: 978-0415583367 ISBN-10: 0415583365	
Reference Book (s): • Bergh, DD, Ketchen DJ. (2009). Research Methodology in strategy and management, vol. 5. Emerald group publishing. ISBN-978-1-84855-158-9 ISSN: 1479-8389 (series	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Construction Contracts and Procurement	Coordinator	
Course Code	CE784	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/1
Course Objective: • The course reviews Schedule, Budget, Resources relationship for projects • Project delivery systems and contract management Contract Field Engineer typical interfaces basic requirements for a contract • General Conditions of Contract Special Conditions of Contract Pricing & Proposal Information Technical Specifications Drawings and Amendments			
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentation)			
Expected Course Learning Outcome (CLOs): Knowledge • Describe the essential elements of the bid process, process of bidder pre-qualification, the components of a bid package, and criteria for bid analysis • Understand the principles of dispute resolution in construction contracts, including commercialism, liability, and risk attitudes. Skills • Evaluate and analyze bid proposals, including unit prices and premium portions of overtime rates, to make informed decisions during the bid evaluation process. • Analyze the effects of changes due to differing conditions, delays, disruptions, and interferences on construction projects, including breach of contract and claim management. Value • Recognize the importance of defining clear system boundaries and project scope in achieving project objectives, reducing risks, and ensuring effective contract management throughout the project lifecycle.			
Course Contents:			
Unit 1:	Defining the system boundaries and project scope (feasibility, design, build, operate, maintenance, decommissioning asset management), The common construction contracts including NEC, FIDIC and JCT16, Nature of international construction projects, Procurement methods, Contractual procedures, Insurance and indemnity, Introduction to basics of contract administration, Change orders and field work orders, Back charges, Turnover sequence chart, Reading the contract		

Unit II:	Bid Process and Bid Evaluation, basics of the bid process, important points in a tender document, and unbalanced contracts, Request for Proposal and problems, Different types of proposals, Design Conditions and Standard Component List, Tender document – Unbalanced proposals Exercises: Evaluating Unit Prices Premium Portion of The Overtime Rate
Unit III:	Bidders list, Bidder pre-qualification, The bid package, Bid analysis
Unit IV:	Changes due to differing conditions, Delays, Disruptions, Interferences Ripple or Impact, Effect of changes, Breach of contract, Claim management, Dispute and Resolution in construction contracts, Commercialism, liability, change, risk attitudes, Dispute management
Textbooks • Will Hughes (Author), John Murdoch, Construction Contracts: Law and Management 6th Edition, Routledge, 2016. • Gerardus Blokdyk, Procurement Management, 3rd edition. 5STARCOoks, 2021. • Allison Reich, The Complete Guide to Procurement Management, 2024	
Reference Book (s): • Augustine Edobor Arimoro: The public-private partnership contract, Taylor and Francis Group, 2020. • Denise Bower, Management of Procurement Thomas Telford, 2003., ICE Publishing (1 Jan. 2003), ISBN-13: 978-0727732217	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Risk management in construction	Coordinator	
Course Code	CE785	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/1
Course Objective: This course aims to equip students with practical knowledge of risk management principles, focusing on risk identification, analysis, and strategy development. It covers the design, implementation, and management of risk programs, emphasizing loss reduction, financial performance improvement, and adaptability to internal and external challenges.			
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentation)			
Expected Course Learning Outcome (CLOs): Knowledge - Describe different types of risks in construction projects and their sources, including risks associated with international construction project joint ventures. - Understand the principles of qualitative and quantitative risk assessment Skills - Apply risk identification techniques to identify and document potential risks in construction projects, including those specific to joint ventures and international projects. - Develop and apply practical approaches to manage and allocate risks in various project scenarios, including insurance and contractual mechanisms. - Conduct qualitative and quantitative risk assessments to evaluate potential risks and their impact on construction projects. - Develop and utilize risk models and simulations to analyze and mitigate risks in construction projects, including financial risks. Values - Recognize the importance of thorough risk identification in proactively addressing potential issues and enhancing project resilience, leading to better project outcomes and reduced uncertainty. - Engage in lifelong learning and professional development in the field of Risk management in construction			
Course Contents:			
Unit 1: Risk identification:	Risk definition, Coping with risks; Elements of risk management; Project Environment and Types of Risks in Construction Projects; Risk Management System in Construction Projects; Risk Identification Techniques; Risks in International Construction Project Joint Ventures		
Unit II: Risk Management:	Risk containment; Sources of contractual risks; Risk allocation tools (Contractual, Insurance); Practical Approaches		

Unit III: Principles of Risk Analysis:	Qualitative Risk Assessment, Quantitative Risk Assessment; Decision-Theory, Risk and Uncertainty; Decision-Making Under Risk; Decision-Making Under Uncertainty, Utility and Multi-Criteria Decisions, Summary of the Decision-Making Process
Unit IV: Risk Modeling:	Risk Modelling and Simulation for Construction Projects; Risk Mitigation Strategies; Risk Allocation in Contracting and Procurement; Managing Financial Risks
Textbooks • Stephen O. Ogunlana and Prasanta Kumar Dey, Risk Management in Engineering and Construction: Tools and Techniques (Spon Research), Routledge; 1st edition 2019 ISBN-13 : 978-0415480178	
Reference Book (s): • Palmer, William J., Construction Insurance, Bonding, and Risk Management 1st Edition.1996 • Davis, S. D. and Prichard R., AGC, “Risk Management & Insurance Bonding for the Construction Industry”, Associated General Contractors Of America (2000)	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Project Financial Management	Coordinator	
Course Code	CE786	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/1
Course Objective: This course aims to provide a comprehensive understanding of financial management in construction, focusing on cash flow, accounting, financial analysis, sureties, and insurance. Students will learn to apply project finance principles to minimize risk and develop strategic planning processes, ensuring effective financial management within the construction environment.			
Teaching Method: Lectures, Training exercises (Tutorial, Reports writing and presentation)			
Expected Course Learning Outcomes (CLOs): Knowledge - Explain the purpose and components of cash flow statements and financial statement analysis - Understand the principles of working capital management, including financing, optimal planning, and the time value of money concepts such as future value, present value, and annuities. Skills - Create and analyze cash flow statements to assess a company's liquidity, operational efficiency, and cash management. - Apply suitable project delivery methods and contract types based on the specific risks and characteristics of a given project. - Assess and analyze the effects of operating and financial leverage on a company's financial performance, making strategic decisions to optimize leverage and risk management. - Apply time value of money calculations to make informed financial decisions and evaluate investment opportunities. Values - Appreciate the role of ethical accounting practices and corporate social responsibility in maintaining organizational integrity and stakeholder trust - Commit to lifelong learning by applying advanced financial principles and ethical practices to enhance expertise in construction project management.			
Course Contents:			
Unit 1	- Introduction to accounting principles, Financial Ethics & Corporate Social Responsibility - Cash Flow Statements: Creating, analyzing, utilizing - Financial Statement analysis: financial ratios, DuPont system, measuring company performance		

Unit II	Financial planning: developing pro forms (forecasts), Explain formal methods of risk assessment in construction, differentiate project delivery methods by the type of risk exposure and apply suitable contract types for a given set of project characteristics
Unit III	Operating and Financial Leverage: Analyzing tradeoffs & determining optimal balance
Unit IV	Working Capital Management: Financing working capital & optimal plan, term structure of interest rates, float, inventory management & EOQ, collection policy & discounts
Unit V	Concept of Time value of Money: Sources of financing; Time Value of Money: Future Value, Present Value, Annuities; Security Valuation & Rates of Return Portfolio management; Depreciation and Taxation; Financial monitoring
Unit VI	National economic status and impact on construction; Financial accounting and budgeting; International finance; Role of financial institutions; Project financing norms and procedures of International financial institutions; Financial management of international projects;
Textbooks - Bamber, M., Parry S (2017) Accounting and finance for managers: a decision-making approach London, Kogan Page 2nd edition (ISBN-13: 978-0749481148) - Financial Management In Construction Contract (2013), Andrew Ross & Peter William, Wiley-Blackwell, ISBN (13): 978- 1405125062	
Reference Book (s): - Construction Accounting and Financial Management (2012) Steve J. Paterson, 3rd Edn, ISBN (13): 978-01322675055 - John Vail Farr, Isaac J. Faber, Engineering Economics of Life Cycle Cost Analysis, CRC Press, 2023	
Mode of Evaluation: - Assignments, reports/presentations (20 %) - Quizzes (20%) - Midterm exam (30 %) - Final Exam. (30 %)	

Course Title	Computer applications in construction	Coordinator			
Course Code	CE787	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		2/2	
Course Objective: The main purpose of this course is the efficient and effective management of the construction of projects including budget, schedule, and safety requirements using computer applications with respect to professional ethics. Industrial resources including associations and organizations, professional publications, and governmental data will be analyzed and evaluated using modern tools.					
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)					
Expected Course Learning Outcomes (CLOs):					
Knowledge Explain the role and impact of computer applications and information technology (IT) in the construction industry, including their benefits for project management and operational efficiency.					
Skills - Create and manage construction documents using MS Excel, applying features such as formulas, data validation, and conditional formatting to ensure accuracy and efficiency. - Apply financial functions in MS Excel to perform calculations related to the construction process and create Application for Payment forms with accurate financial data. - Use MS Project software to generate and manage a project plan, including creating sequences of applications for payment and developing comprehensive project schedules. - Implement scheduling techniques in MS Project to optimize project efficiency, manage resources effectively, and control cost components within a project plan.					
Course Contents:					
Unit 1:	Introduction to computer applications in construction of buildings and project management				
Unit II :	Forms of construction documents, MS Excel features to insure document accuracy and efficiently produce documents				
Unit III:	Financial functions in MS Excel for calculations related to the construction process, create Application for Payment forms,				
Unit IV:	Generate sequence of applications for payment, project plan by using MS Project software				
Unit V:	Project plan and implement scheduling techniques to improve efficiency, resources and cost components to a project plan in MS Project				
Unit VI :	Professional and ethical standards of behavior in dealing with all stakeholders in the construction process.				

Textbooks • Tarek Hegazy, Computer-Based Construction Project Management: Pearson New International Edition –2013 • Sun, M., & Howard, R. (2016). <i>Understanding IT in Construction</i> . CRC Press. Retrieved from https://www.perlego.com/book/1614819/understanding-it-in-construction-pdf • Christoph Motzko, Lingua Nova, Computer Methods in construction”. Warszawa, 2011.
Reference Book (s): • Boyd C. Paulso “Computer Applications in Construction (Mcgraw Hill Series in Construction Engineering and Project Management) Hardcover –1994.
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)

Course Title	Value Engineering	Coordinator			
Course Code	CE788	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		2/2	
Course Objective: Construction Value Engineering is the study of designs and systems prior to the issue of final production drawings. purpose of value engineering is to help maintain or improve profitability in spite of increasing costs and competition.					
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)					
Expected Learning Outcome: Knowledge: - Understand the purpose of value engineering in enhancing product value and reducing unnecessary costs. - Explain concepts such as functional cost, functional worth, and tests for poor value in the context of value engineering. Skills: - Apply the principles of value engineering to analyze and improve the value of a product throughout its life cycle, using appropriate methodologies and techniques. - Evaluate and select appropriate cost reduction techniques and value engineering strategies to address unnecessary costs and enhance product value effectively. - Implement the phases of the value engineering job plan to systematically analyze and enhance product value, ensuring thorough documentation and application of each phase to achieve optimal results. - Create and interpret FAST diagrams to analyze and improve the function of a product, using the FAST method to visualize function relationships and identify critical areas for value enhancement. Values - Recognize the significance of a systematic approach in value engineering to ensure comprehensive analysis and effective implementation of value improvement strategies.					
Course Contents:					
Unit 1:		Introduction, Life cycle of a Product, Definition, objectives and methodology of value Engineering			
Unit II :		Comparison with other cost reduction techniques, unnecessary cost. Quantitative definition of values, alternatives to increase value,			
Unit III:		Type of value, estimation of Product Quality/performance. Functions: definition, types and relationship between different functions in design of a Product, functional cost,			

	functional worth, test for poor value, aim of value engineering.
Unit IV:	Systematic approach, Phases of value engineering Job plan: General phase, information phase, function phase creation/speculation phase, evaluation phase, investigation phase, recommendation and implementation phase.
Unit V :	Decision /evaluation Matrix: Quantitative comparison of alternatives, estimation of weight factors and efficiency. FAST diagramming: Critical path of function, How, why and when logic, supporting and all time functions, Ground rule for FAST diagram. Case studies
Textbooks - L.D. Miles., “Techniques of value analysis and value engineering - Lawrence D. Miles Value Foundation (March 9, 2015), - John Kelly, Steven Male & Drummond Graham, Value Management of Construction Projects, John Wiley & Sons 2014. - A.E. Mudge, “Value Engineering – A systematic Approach” McGraw-Hill Inc.,US; First Edition, 3rd Printing edition (October 1971), ISBN-13: 978-0070439542	
Reference Book (s): Alphonse J. Dell'Isola, PE, CVS R. S. Means, Value Engineering: Practical Applications...for Design, Construction, Maintenance & Operations, John Wiley & Sons 2009.	
Mode of Evaluation: - Assignments, reports/presentations (20 %) - Quizzes (20%) - Midterm exam (30 %) - Final Exam. (30 %)	

Course Title	Infrastructure Development and Management	Coordinator			
Course Code	CE789	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		2/2	
Course Objective: This course aims to provide students with a thorough understanding of infrastructure nature, operation, and management in construction. Emphasizing the development of analytical skills and practical knowledge, it also highlights the importance of interdisciplinary collaboration in addressing infrastructure-related challenges. Additionally, the course imparts a theoretical understanding of various design concepts involved in infrastructure planning.					
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)					
Expected Course Learning Outcomes (CLOs):					
Knowledge - Describe the role of infrastructure, government initiatives in infrastructure development, and specific infrastructure scenarios and challenges in Saudi Arabia. - Understand the life cycle perspective of infrastructure projects, social benefits, integrated impact assessments, and infrastructure project finance and maintenance.					
Skills: - Analyze infrastructure scenarios and problems in Saudi Arabia, applying models and government initiatives to develop solutions for local infrastructure management challenges. - Conduct feasibility appraisals and due diligence for infrastructure projects, incorporating techno-legal and regulatory considerations, and apply lifecycle perspectives to manage project finance and maintenance effectively. - Collaborate with different professionals to develop and implement sustainable infrastructure solutions, incorporating innovative practices and sustainability principles into infrastructure decision-making processes. - Evaluate and address issues in infrastructure management, and incorporate smart infrastructure solutions to enhance the efficiency, sustainability, and resilience of infrastructure systems.					
Values - Recognize the critical role of effective infrastructure management in local government and its impact on community development and well-being. - Commit to lifelong learning by mastering infrastructure management, sustainability, and stakeholder integration to address and innovate infrastructure challenges.					

Course Contents:	
Unit 1:	Introduction to infrastructure management from a local government Perspective: Understanding of Infrastructure, Types of Infrastructure, Evolution and growth of infrastructure; Models on infrastructure development; Government's initiatives in infrastructure; Role of Infrastructure, Infrastructure scenarios in Saudi Arabia and problems of Infrastructure Development in Saudi Arabia
Unit II :	Infrastructure Policy & Regulation; Land procurement; Project clearances; Appraisal of techno-legal and regulatory aspects of infrastructure; Infrastructure Project Feasibility - Appraisal and Due Diligence; Life Cycle perspective of infrastructure; Social benefits of infrastructure development; Integrated impact assessment; Infrastructure project finance; Infrastructure Project maintenance
Unit III:	Basic understanding of inter relationship of different infrastructure systems working, such as, water treatment, storm water management.
Unit IV:	Role of engineers, planners, public administrators, landscape architects, architects, etc. in infrastructure development; impacts of the concept of sustainability implementation in infrastructure decision making and innovation
Unit V:	Construction Infrastructure management – theoretical factors and techniques of evaluation
Unit VI:	Various issues in Infrastructure management, Smart infrastructures
Textbooks	
• K. Wellman and Marcus Spiller; Urban Infrastructure: Finance and Management, 2012, ISBN: 978-0-470-67218-1, • Juri Sutt and Irene Lill; Engineers Manual of Construction Site Planning, John Wiley & Sons, 2013,	
Reference Book (s):	
• ULI and Ernst & Young (2013) Infrastructure 2013: Global Priorities, Global Insights, The Urban Land Institute, Washington DC.	
Mode of Evaluation:	
• Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Quality and Safety in Construction	Coordinator	
Course Code	CE790	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/2
Course Objective: Quality control and safety represent increasingly important concerns for project managers. Defects or failures in constructed facilities can result in very large costs. Even with minor defects, re-construction may be required and facility operations impaired. Increased costs and delays are the result. In the worst case, failures may cause personal injuries or fatalities.			
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)			
Expected Course Learning Outcomes (CLOs): Knowledge Outcome: - Describe the principles of Total Quality Management (TQM) and the significance of quality assurance and quality control. - Explain the fundamentals of safety management in construction, including the cost of accidents, the role of construction personnel in safety and health, and accident causation theories. Skills - Develop and implement a Project Quality Plan (PQP) that integrates quality and safety management practices to ensure effective project execution and compliance with industry standards. - Apply quality assurance and control techniques, and implement quality management systems (QMS and EMS) to enhance quality performance and compliance in construction projects. - Utilize statistical quality control techniques to analyze data, monitor quality metrics, and implement improvements based on sampling results and statistical analysis. - Conduct effective accident investigations, maintain accurate records, and develop comprehensive emergency response plans. Values: - Recognize the value of quality assurance and control in achieving high standards of quality and the benefits of adopting ISO standards for continuous improvement.			
Course Contents:			
Unit 1:	Introduction to Quality, Quality Management Theories, Cost of Quality, quality indicators, Concept of Quality management and safety management for the construction industry, Project Quality Plan (PQP)		

Unit II :	Quality Assurance and Quality Control, Principles of Total Quality Management, Introduction to Quality Standards, QMS (ISO 9000), EMS (ISO 14000) and their Benefits
Unit III:	Statistical Quality Control with Sampling by Attributes, statistical Quality Control with Sampling by Variables
Unit IV:	Construction of safety management, Introduction to Safety, Cost of Accidents, Role of Construction Personal in Safety and Health, Accidents Causation Theories, Ethics in Safety and OSHA compliance
Unit V :	Accident Investigation, Reporting and Record Keeping, Emergency Response plan, OSHA's Construction standards and related safety practices (Selected Subparts A-Z), Preventing violence in workplace, stress and behavior based safety, Promoting safety
Textbooks • Tang, S.L., Ahmed, S.M., Aoieong, Raymond T. and Poon, S.W., Construction quality management, Hong Kong University Press, Hong Kong, 2017. • Malcolm Watson, Construction Health, Safety, and Risk Management Made Easy: Project Best Practices Solution, 2024 • Tim Howarth, David Greenwood, Construction Quality Management: Principles and Practice, Routledge, 2017	
Reference Book (s): • Poon, S.W., Tang, S.L. and Wong, Francis K.W. (2008), Management and economics of construction safety in Hong Kong, Hong Kong University Press, ISBN-13: 978-9622099067	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Sustainable Materials and Green Buildings	Coordinator	
Course Code	CE791	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/2
Course Objective: This course focuses on applying the sustainable development paradigm to the built environment, emphasizing the reduction of human impact on natural ecosystems and understanding their role in the economy and human welfare. It covers sustainable materials, green building design, and addresses critical issues like resource depletion, rising energy costs, pollution, environmental degradation, and climate change.			
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)			
Expected Learning Outcome: Knowledge: - Explain the concept of sustainable development in the built environment, including the ecological footprint, carbon footprint, and measures for footprint reduction. - Gain basic knowledge about energy systems, including exergy, entropy, energy conservation, and renewable energy. Understand the role of materials and embodied energy in life cycle assessment. Skills: - Analyze and apply sustainability principles to real-world construction projects, addressing environmental and resource issues - Apply concepts of energy conservation and renewable energy to design and implement energy-efficient solutions in the built environment. - Develop strategies to reduce ecological and carbon footprints in construction projects. - Prepare projects for certification under green performance rating systems by meeting the requirements of LEED, BREEAM, or similar standards. Values: - Recognize the role of environmental ethics and economics in promoting sustainable construction practices and informed decision-making - Dedicate to lifelong learning by applying sustainable development, environmental ethics, and energy conservation to innovate in construction project management.			
Course Contents:			
Unit 1:	Fundamental concepts of sustainable development in the built environment; the environmental / resources issues and industrial / construction metabolism with examples.		
Unit II :	Environmental ethics and environmental justice; ecological / environmental economics including Life Cycle Costing; building assessment (frameworks) and ecolabels.		

Unit III:	• Basic knowledge about energy systems, exergy, entropy, energy conservation and renewable energy; Life Cycle Assessment, embodied energy, energy, and materials
Unit IV:	• Concept of sustainable development or sustainability in the built environment. Ecological footprint concept, carbon footprint & sustainability, measures for footprint reduction
Unit V :	• Different sustainability frameworks used worldwide, their strengths and weaknesses, New Urbanism, passive design strategies, technologies, ecological principles, and energy conservation measures for efficient buildings.
Unit VI :	• Green Performance rating, requirements of LEED, BREEM etc.
Textbooks • Charles J.Kibert, “Sustainable Construction: Green Building Design and Delivery. Fifth Edition, New York: John Wiley & Sons, 2022., ISBN: 978-1-119-05517-4 • Kubba, S, LEED Practices, Certification, and Accreditation Hand book, 1st ed. Elsevier, 2010.	
Reference Book (s): • RSMeans, Green Building: Project Planning and Cost Estimating, 3rd Edition, ISBN: 978-1-118-03003-5 January 2011 480 pages	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Building Services and Maintenance Management	Coordinator	
Course Code	CE792	Credit Hrs.	3
Prerequisites	NIL	Level/Year	2/2
Course Objective: • Optimal satisfaction of building maintenance requirements • Efficient and cost-effective maintenance and operation of building services • Professional standards of procurement from, and management of, specialist consultants and contractors • Disaster and Disaster Recovery			
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)			
Knowledge: • Understand the importance of maintenance contracts, minimum standards for inspection, and operating and maintenance documentation. • Describe the contractor start-up and handover procedures, including commissioning processes, pre-start-up procedures, equipment and system start-up, operator training, and handover documentation. Skills: • Develop and implement a proactive maintenance strategy, manage maintenance contracts, and establish and adhere to minimum inspection standards. • Conduct comprehensive cost analysis for building ownership, including estimating and managing various cost components • Conduct effective risk assessments, develop and implement emergency response plans, and ensure preparedness for managing emergencies. Activate and manage emergency response plans as required. • Apply best practices in building maintenance management, using benchmarking and continuous improvement methodologies to enhance performance. Values: • Appreciate the value of transitioning to proactive maintenance and establishing clear standards for maintenance and safety to improve building performance and longevity.			
Course Contents:			
Unit 1:	Building services fundamentals, function of services in commercial buildings and their importance to the core business, Electrical services, Lighting, Heating, Ventilation and air conditioning, Lifts, Water, provision of comfort and safety, Statutory requirements, Health and safety legislation, Control of contractors, Risk assessment, Fire precautions		
Unit II :	Maintenance Techniques - Maintenance strategy and control, transitioning from reactive to proactive maintenance, maintenance		

	contracts, establishing a minimum standard for inspection and maintenance of equipment, operating and maintenance documentation, Safety Maintenance
Unit III:	Building Maintenance Management Systems – techniques of evaluation and periodical maintenance
Unit IV:	Owning and Operating Costs - First costs of building ownership, new building construction project delivery methods, estimating costs, service life, depreciation, recurring cost, maintenance costs, utility costs, regulatory costs, utility billing analysis, and economic analysis
Unit V :	Contractor Start-Up and Handover Procedures - commissioning process and testing, Pre-start-up procedures, equipment and system start-up and testing, operator training, substantial completion and occupancy permit, handover procedures, record drawings, operating and maintenance documents, warranty, and post warranty operation.
	Risk Assessment Procedures - Defining risk and types, emergency response plans (before and after emergency), activating an emergency response plan.
	Best Practices in Building Maintenance Management - Benchmarking and performance improvement, Continuous improvement methodologies, Incorporating sustainability in maintenance practices, Future trends and emerging technologies in building maintenance
Textbooks • Paul Wordsworth, Building Maintenance Management, John Wiley and Sons Ltd, Chicester, 2013, • P.S. Gahlot, S. Sharma, Building Repair and Maintenance Management, CBS Publishers, 2019.	
Reference Book (s): • Brian J.B. Wood, Building Maintenance, Wiley-Blackwell, 2009. • Building Services Maintenance Management: TM171990, <i>Technical memoranda TM17 : 1990, Issue 17 of Technical memoranda</i>, Chartered Institution of Building Services Engineers	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Construction Practices and Equipment	Coordinator			
Course Code	CE793	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		2/2	
Course Objective: This course aims to familiarize students with various construction techniques, practices, and the equipment required for different construction activities. It provides a comprehensive understanding of construction procedures from substructure to superstructure, ensuring that students gain practical knowledge of the equipment and methods essential for constructing various types of structures.					
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)					
Expected Course Learning Outcomes:					
Knowledge: • Explain the fundamental principles of construction equipment management • Describe the fundamentals of earthwork operations, including the types of equipment used for earthmoving, and compacting equipment.					
Skills: • Select and effectively use the appropriate earthwork equipment for various earthmoving operations. Plan and execute earthwork tasks, ensuring the efficient and safe operation of equipment such as loaders, excavators, and compactors. • Manage specialized construction equipment for various tasks, including dredging, trenching, and pile driving. • Manage asphalt and concrete plants effectively, including the use of batching and mixing equipment.					
Values: • Recognize the value of selecting and operating appropriate earthwork equipment to ensure efficient and accurate execution of earthmoving operations.					
Course Contents:					
Unit 1: Construction Equipment and Management		Identification – Planning of equipment – Selection of Equipment - Equipment Management in Projects - Maintenance Management – Equipment cost – Operating cost – Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment- Replacement Analysis - Safety Management			
Unit II: Equipment for Earthwork		Fundamentals of Earth Work Operations - Earth Moving Operations - Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing equipment.			

Unit III: Other Construction Equipment	Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane - Types of pumps used in Construction - Equipment for Dewatering and Grouting – Equipment for Demolition
Unit IV: Asphalt and Concrete Plants	Aggregate production- Different Crushers – Feeders - Screening Equipment - Handling Equipment - Batching and Mixing Equipment - Pumping Equipment – Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment
Unit V: Materials Handling Equipment	Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes- Industrial Trucks.
Textbooks • Peurifoy, Robert L., Clifford J. Schexnayder, Aviad Shapira, Robert L. Schmitt, and Aaron Cohen. 2024. Construction Planning, Equipment, and Methods. 10th ed. New York: McGraw Hill. https://www.accessengineeringlibrary.com/content/book/9781264278725 • Schaufelberger, John E., Migliaccio, Giovanni C., Construction Equipment Management, Taylor & Francis Inc, 2019	
Reference Book (s): • Deodhar, S.V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi, 1988, ISBN 9788174091147	
Mode of Evaluation: • Assignments, reports/presentations (20 %) • Quizzes (20%) • Midterm exam (30 %) • Final Exam. (30 %)	

Course Title	Master's Thesis	Coordinator			
Course Code	CE799	Credit Hrs.	3	Contact Hrs.	3
Prerequisites	NIL	Level/Year		1-2/2	
Course Objective: This course is designed to equip students with advanced knowledge and research skills in specialized areas of civil engineering, preparing them to tackle current and future challenges in the field. It focuses on developing the ability to conduct successful research, effectively communicate findings through writing and presentations, and apply advanced technical expertise in professional civil engineering practice.					
Teaching Method: Lectures, Training exercises (Tutorial, Lab Reports writing and presentation)					
Expected Course Learning Outcomes:					
Knowledge: • Define the in-depth fundamental knowledge on the fundamental design of complex project management problems. • Define and understand the research methodology and inquiry techniques related to project management problems. • To apply new knowledge related to project management using the appropriate learning strategy. • To demonstrate the applications of research methods in lifelong learning in the civil engineering profession.					
Skills: • To identify, formulate, and solve complex engineering problems by applying principles of project management. • To solve project management problems based on public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. • To communicate effectively (oral/written). • To develop and conduct appropriate experimentation, collect data, analyze, and interpret the unknown factors responsible for providing an optimal solution to civil engineering problems. • An ability to function effectively on a team to meet objectives.					
Values: • Demonstrate a professional and ethical deal with all stakeholders in the construction activities and make responsible decisions. • Engage in lifelong learning and professional development in the field of construction project management.					
Course Contents:					
Unit 1:		Concepts of thesis writing and problem formulation			
Unit 2		Collection of literature work related to research and/or development within a chosen area			
Unit3		Preparing a proposal for Thesis area that may comprise theoretical, numerical, experimental or field studies			

Unit 4	Developing a plan for implementation of the Thesis
Unit 5	Preparing a systematic developmental plans necessary for conducting an experimental or analytical studies in the chosen field of investigation
Unit 6	Develop expertise in making an independent engineering research work, receive training in planning
Unit 7	Organize a systematic collection of data and summarizing the research tools necessary for implementation of the prototype testing
Unit 8	Analysis of the data and develop a hypothesis testing to validate the model studies
Unit 9	Collection of research results and writing a technical report
Unit 10	Preparation of final thesis document pertaining to standards
Textbooks - Fellows, R. F., & Liu, R. A. (2022). <i>Research Methods for Construction</i> (5th ed.). Wiley-Blackwell. ISBN: 978-1119585724. - Boulton, G. C., & Bradley, M. P. (2022). <i>Applied Research Methods in Construction</i> (2nd ed.). Routledge. ISBN: 978-0367338924.	
Reference Book (s): - Edwards, P., & Watson, P. (Eds.). (2023). <i>Construction Research: Practice and Principles</i>. Routledge. ISBN: 978-0367338979. - Paul Oliver, "Writing your project work" SAGE publications, 2010, ISBN – 978-1-4462- 6784-4 - Naoum, SG. (2007). <i>Dissertation research and writing for construction students</i>. 2nd Edison. Routledge (Taylor & Francis Group)	