

Module (Course Syllabus name) Catalogue

2023-2024

College/ Institute	Erbil Polytechnic University	
Department	Road construction	
Module Name	Quantitative Survey-Estimation	
Module Code	QSE402	
Degree	Technical Diploma <input checked="" type="checkbox"/>	Bachelor <input type="checkbox"/>
	High Diploma <input type="checkbox"/>	Master <input type="checkbox"/> PhD <input type="checkbox"/>
Semester	4	
Qualification		
Scientific Title	Quantity Surveying and Estimation	
ECTS (Credits)	6	
Module type	Prerequisite <input type="checkbox"/>	Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>
Weekly hours	4	(162)Total hrs Workload
Weekly hours (Theory)	(2)hr Class	
Weekly hours (Practical)	(2)hr Class	
Number of Weeks	12	
Lecturer (Theory)	Saud Ahmed Hussein	
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Lecturer (Practical)	Saud Ahmed Hussein	
E-Mail & Mobile NO.	saud.hussein@epu.edu.iq 07507009339	
Websites		

Course Book

Course Description	<p>Official Course language is: English language</p> <p>Passing score is : 60 out of 100</p> <p>Course weekly hours: 4 hours (2 theoretical + 2 Practical)</p> <p>Score distribution: 60% (during the year evaluations and exams) + 40% (end of the year exams)</p> <p>This course is one of the (core) secondary-minor courses for the second year (4th semester) students in the road construction departments or it's a basic course in all (civil engineering departments) . It is aims to introduce students that Quantity Survey/Estimation is office and field survey preparations with measuring , calculating and performing serialized activity procedures , to explain and estimate the quantities and the types of the (construction works , construction/building materials , and all necessary equipments and machineries such as (equipments , machines , tools , apparatus , sets , instruments , and etc. , and needed workers and labours and craftsmen) needed for implementing/executing all the engineering work items in a construction project .</p> <p>It is also estimating and assessing of the prices and the costs with all expenses for the each work items then for (determining , controlling and minimizing) overall costs of all the works of the project , provided that to be according to the specifications , standards and the engineering conditions , with necessity of putting into consideration the (technical , administrative , finance and legal) concerns/affairs to implement it . In addition to evaluating/estimating needed (times , periods and time appointing) for each work items with scheduling the process/progresses in order to accomplishing of the project (entirely) at a typical period of time with achieving a good management and quality of the project</p>
Course objectives	<p>The aim of the study of this course to enable the students to work after graduation according to scientific approach also aims to achieve the following objectives:</p>

1 – Good knowledge and inclusive information about the type and sector/class of the project (works) that he estimates whether it (residential houses , road projects , apartments , commercial buildings , irrigation projects , etc.) .

2 – A clear ability of understanding and practiced to the specifications , standards and engineering conditions and have good instructions about the set of designs and plans of all work items of the project .

3 – Accurate and complete information about the (prices , rates , costs , charges , wages and salaries) and kinds of the all primary (initially) construction/building materials and all their requirements , in addition to that he should have wide information about the necessary needed equipments and machineries and their (availability , usage , utilizing) .

4 – Be precise in measurements and calculations to estimate all measurements of the engineering work items for preparing and arranging **primary/initially** bill of quantities and the **performed/actually** bill of quantities of the project .

5 – Practical and field experience to implement and performing the project exactly accordance to the specifications and engineering conditions and the set of (designs , drawings and plans) .

6 – Able to arrange and to follow in succession of the interlaced or overlapped work items in the bill of quantities with scheduling them uniformly in the timetable of the project .

7 – Well able to estimate the (needed times , periods , durations and time appointing) for implementing of the engineering work items of

	<p>the project , in order to preparing and drawing a typical (timetable or schedule progress of the work) .</p> <p>8 – Expert and have a good capability to manage/administrate the projects in the all implementing stages/phases in most matters especially in the technical affairs to be aware to find the best solutions and to optimize for dealing with the problems and obstacles (if where) during the implementation .</p> <p>9 – Gathering complete and all out data about the general conditions of the project site and the surrounded areas , specially about the (restrictions , obstructions , problems , interferences , etc.) .</p> <p>10 – Well informed and have tendency for realizing the general situations and (economical , commercial) cases , as well as should have expectations to the prospectively alterations and able to deal with them for founding alternatives/solutions .</p>
<p>Student's obligation</p>	<ul style="list-style-type: none"> • Students should attend the theoretical lectures (2 hour weekly) and also should attend the practical-tutorial lectures at the laboratory or the class or the site (2 hours weekly). • Students requested to match deadlines for submitting their homework's and reports and assignments given by the lecturer. • Students should be ready for unannounced short quizzes from previous lectures. • Students are requested to provide detailed reports for the scientific visits arranged to the projects under construction. • Students should prepare themselves for the semester's major theoretical exams (announced exams). <p>Students should prepare themselves for the end year the theoretical exams (both first attempt or second attempt).</p>
<p>Required Learning Materials</p>	

		Task	Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation		Paper Review			
	Assignments	Homework	10%		
		Class Activity	2%		
		Report	16%		
		Seminar			
		Essay			
		Project			
		Quiz	8%		
		Lab.			
		Midterm Exam	24%		
		Final Exam	40%		
		Total	100%		
Specific learning outcome:	<p>1- Students when they are graduates and will be ready to work as a Surveyor or estimator, where the surveyor or estimator, is the person/individual or the (team, group, company) who measures, calculates and estimates the quantities of the work items for an engineering project, and also the quantities of the primary construction/building materials. He also defines and describes the implementing technique procedures/progresses, as well as the quantities and types of the needed (equipments, machines, tools, apparatus, sets, devices, instruments, etc.).</p> <p>In addition to above mentioned, he also estimates and assesses the (prices, rates, costs, wages, salaries, expenses) and appraises all other expenditures which concern those construction/building materials and all the other requirements for constructing, along with ensuring and deserving all rights of the (labors, team workers,</p>				

	<p>employees and staffs) who charged for implementing the project .</p> <p>In spite of above surveyor or estimator must be very able to evaluate and estimate (the needed times with scheduling and arranging its periods and its time appointing) in the different stages/phases for all of the work items of the projects , in accordance with the engineering specifications and implementing conditions and the set of designs and plans .</p> <p>2- 3- 4- 5- 6-</p>	
<p>Course References:</p>	<p>Key references:</p> <ul style="list-style-type: none"> • Quantity Surveying and Construction • Manual for consultant quantity surveyors • Construction Equipment book • English for the students of Civil Engineering • Laboratories test guides • PowerPoint slides from internet. • Short videos from internet. • Photos from internet. • Researches published in internet. • Previous lectures. • كتاب التخمين و المواصفات للمؤلف مدحت فضيل • كتاب حساب كميات المواد و المواصفات / الشروط العامة للمقاولات (الجزء الاول و الثاني) • كتاب التخمين و المواصفات للمؤلف يوسف ناصر و نزار عسكر • 	
<p>Course topics (Theory)</p>	<p>Week</p>	<p>Learning Outcome</p>
<p>QUANTITY SURVEYING OR ESTIMATION IN CONSTRUCTION CIVIL ENGINEERING PROJECTS , Estimation and Engineering</p>	<p>1</p>	

<p>Sense ,</p> <p>Qualifications and Capabilities of an Expert/Professional Quantity Surveyor or Estimator</p> <p>Definition of surveyor and estimator , illustrative diagram of the quantity survey/estimation</p> <p>The main aim of quantities surveying and estimation in the construction/building projects Definition of quantities surveying and estimation</p>		
<p>TYPE OF ESTIMATION , COST ESTIMATIONS OF PROJECT CONSTRUCTION , Material Resources and Material Costs , Labor Resources and Labor Costs , Equipment Resources and Equipment Costs , Overhead (project overhead and general overhead) Costs</p>	2	
<p>Wages and Salaries , Supply and Demand , Quantity and Quality</p>	3	
<p>Valuation of Land , Estate or (Real Estate) and Plot , Valuation of Building and Property</p>	4	
<p>Work Scheduling and Planning in Construction Projects , Bill of Quantity</p>	5	
<p>Typical Phases in Construction Projects , Projects-Facilities Costs</p>	6	
<p>Investment Project and Feasibility Study , Schematically Diagram of Phases in Investment Project Life Cycle</p>	7	
<p>Projects Management (Project , Planning , Management) , Fundamental steps of construction project management</p>	8	
<p>Contract or Agreement , Construction Contract Agreement , Classification of Contractors or Contracting Companies</p>	9	
<p>Type of Construction Contract</p>	10	
<p>Tendering Process of Construction Project Procurement</p>	11	
<p>Essential Sections and Main Contractual Documents of the Construction Contracts</p>	12	
<p>Practical Topics</p>	Week	Learning Outcome
<p>Summary of practical lecture (tables , diagrams , equations , formulas and deferent construction information)</p>	1	

<p>Measuring units , international system of units SI and Imperial/English units Some different estimated information , Exercises and examples of measuring units , SI and English units</p>		
<p>Foundation , Time bar chart , Sequence of works , Phases of building house</p> <p>Discussion and debates of assessment and valuation of the error percentage ratios in estimations of (totally costs and needed times) for implementing any construction/building projects</p>	2	
<p>design of bearer-support wall , practical design section , bearer-support wall building (simple room)</p> <p>Exercises and examples of measuring , estimating and determining (thickness , lengths , heights , distances , areas and volumes)</p> <p>More difficult exercises and examples of measuring , estimating and determining (thickness , lengths , heights , distances , areas and volumes)</p>	3	
<p>concrete works & materials , classification , information table , reinforced concrete , steel bars , requirements of steel bars</p> <p>Applications for (determining , measuring and estimating) lengths and areas for different engineering shapes Exercises and examples of measuring and estimating areas and volumes for many different shapes</p> <p>Exercises and examples for (determining , measuring and estimating) lengths and perimeter of complex irregular areas</p>	4	
<p>wall definition & types , wall building materials , quantifying of wall masonry works and materials , cement-sand mortar paste</p> <p>Typical Design of Bearer Wall (load bearing wall)</p> <p>Measuring and estimating quantities of masonry works Measuring and estimating quantities of (shuttering works , steel bar reinforcement , concrete casting works ,)</p> <p>Additional exercises and examples of measuring and estimating volumes for many different shapes</p> <p>Measuring and estimating quantities of (masonry building blocks , mortar paste , cement , sand , water ,)</p>	5	

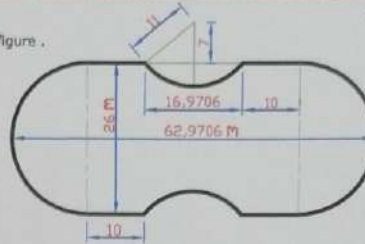
<p>Cement-sand plastering & Gypsum plastering</p> <p>Measuring and estimating quantities of finishing works (gypsum plastering , cement-sand mortar plastering , cement-fine sand rendering , painting ,)</p> <p>Exercises and examples of measuring and estimating (time , period , velocity/speed , discharge ,) Additional exercises and examples of measuring and estimating (time , period , velocity/speed , discharge ,)</p> <p>Measuring and estimating quantities of finishing works (floor tiles , wall tiles , ceilings and walls composite panels , sheets pasting ,.....)</p>	6	
<p>RCC Building , Concrete Frame Structure , beams & ceiling slab</p> <p>Applications for (determining , measuring and estimating) weights , volumes and densities different construction / building materials</p> <p>Shuttering works for casting concrete of (foundations , beams , columns , slabs ,)</p>	7	
<p>Earthworks (Cut & Fill)</p> <p>More applications for (determining , measuring and estimating) weights , volumes and densities different construction / building materials</p> <p>Methods for (determining , measuring and estimating) filling / cutting quantities of earth works from cross sectional areas</p>	8	
<p>Road Pavement Structure and Earth Filling Works</p> <p>Exercises and examples for (determining , measuring and estimating) prices , costs , salaries ,)</p> <p>Applications for (determining , measuring and estimating) filling / cutting quantities of earth works from cross sectional areas and longitudinal profiles</p> <p>Methods for (determining , measuring and estimating) areas and volumes of complex irregular areas</p> <p>Exercises and examples for (determining , measuring and estimating) areas and volumes of complex irregular areas</p> <p>Applications for (determining , measuring and estimating) filling / cutting quantities of earth works from contour lines</p> <p>Measuring and estimating quantities of excavation – cutting and filling earth works</p>	9	

<p>Retaining walls</p> <p>Typical Design of Gravity Retaining Wall</p> <p>Typical design of reinforced concrete retaining wall</p>	10	
<p>Estimation of water flow discharge , runoff and culvert designing</p> <p>Methods for Measuring and estimating quantities of flowing waters</p> <p>Exercises and examples for measuring and estimating quantities of flowing waters in the open channels and sewers</p> <p>Applications for estimating and measuring typical dimensions designs of (canals , sewers , culvert ,)</p>	11	
<p>Conclusions and reviews of (quantifying and estimating) of some essential construction-building works (quantities , costs and times)</p>	12	
<p>Questions Example Design</p>		

- Note :**
- 1- Clarity of the *handwriting* is necessary, and all (alignments or attached) calculated answers should be : legible / readable and written in *ballpoint style* !
 - 2- The arithmetic results or the numbers of the answers will be considered (correct or incomplete answers, if the solving steps and solution / calculations forms are not determinable, or if the answer's numbers are without *quantifying units* or they are in wrong units
 - 3- Sketches and illustrative drawings of the solutions and also the correct writing of (equations, formulas and rules) are considered remarkable part of the solving
 - 4- The typical solutions and correct results / answers of the exam's questions will be announced in (Road Dept.) on the same date when the exam ends

Note 1 : For questions (Q 1 & Q 2) answer only one of them .

Q 1 / Find the net-totally area in (m^2) that bounded by the given engineering figure .



25 Marks

Q 2 / Estimate the totally costs of ((purchasing amount , expenses and wages of (loading , transporting and unloading)) to provide **480 pieces** of wooden planks for shuttering work in a construction work-site , where the planks are of size (**6 m x 4 inch x 1.5 inch**) and :

- 1- Purchasing price is **215 \$** per cubic meter .
- 2- Expenses and wages of (loading , transporting and unloading) are **45 Cent** per plank .

25 Marks

Note 2 : For questions (Q 3 & Q 4) answer only one of them .

Q 3 / List and write down only the **primary phases** in the schematically diagram of phases in the investment project life cycle .

35 Marks

Q 4 / Define very briefly the given below terms :

Conceptual estimation , Bill of quantity , Project management

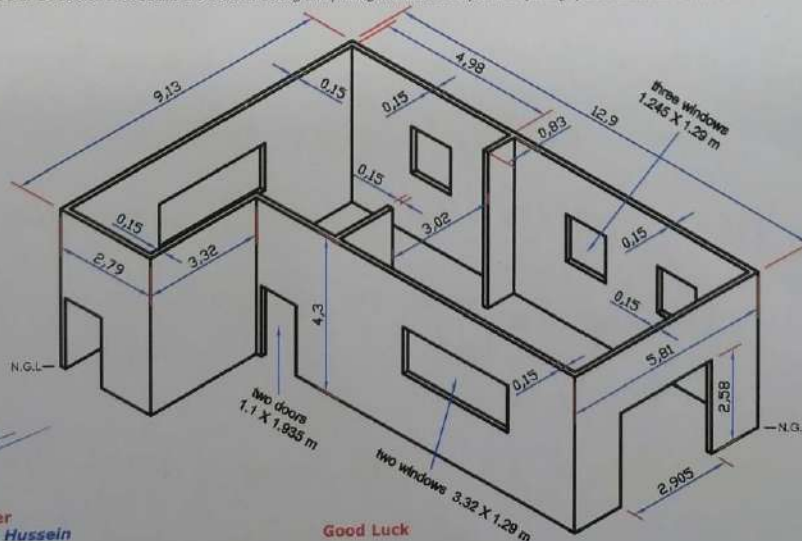
35 Marks

Q 5 / The given isometric-pictorial in figure below is an explaining drawing model of the **ground floor wall** frame of a storehouse building , quantify and estimate the following :-

40 Marks

- 1- Quantity of wall masonry work in (m^3) .
- 2- Required **number of hollow concrete blocks** of size (15 x 20 x 40) cm .
- 3- Required quantity in (m^3) of **cement-sand mortar** paste of mix (1:3) .

Note : Assume that L - section steel beams are used for setting and placing lintels above top of the opening spans of doors and windows .

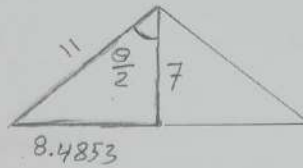


Typical solutions

Q1

$$\cos \frac{\theta}{2} = \frac{7}{11} \Rightarrow \frac{\theta}{2} = \cos^{-1}(0.636363)$$

$$\frac{\theta}{2} = 50.4788^\circ \Rightarrow \theta = 100.9576^\circ$$



area of the circular segment (A_{seg}) =

$$\begin{aligned} A_{seg} &= \pi r^2 \times \frac{\theta}{360} - \frac{8.4853 \times 7 \times 2}{2} \\ &= 3.141593 \times 11^2 \times \frac{100.9576}{360} - 59.3971 \\ &= 106.60358 - 59.3971 = 47.20648 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{net-totally area} &= 36.9706 \times 26 + \frac{\pi \times 13^2 \times 2}{2} - 47.20648 \times 2 \\ &= 961.2356 + 530.9292 - 94.41296 \\ &= 1397.752 \text{ m}^2 \end{aligned}$$

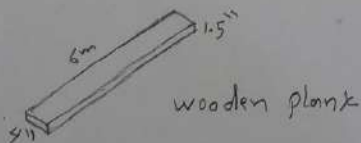
Q2

$$\begin{aligned} \text{Quantity of wood} &= 6 \times \frac{4 \times 2.54}{100} \times \frac{1.5 \times 2.54}{100} \times 480 \\ &= 11.14836 \text{ m}^3 \text{ of wooden plank} \end{aligned}$$

$$\text{purchasing cost} = 11.14836 \times \text{m}^3 \times 215 \frac{\$}{\text{m}^3} = 2396.898 \$$$

$$\begin{aligned} \text{Expenses} &= 480 \text{ plank} \times 45 \frac{\text{Cent}}{\text{plank}} = 21600 \text{ Cent} \\ &= 216 \$ \end{aligned}$$

$$\therefore \text{totally costs} = 2396.898 + 216 = 2612.898 \$$$



[Signature]

Q 3

Necessity of the project (market demands or perceived needs)

Conceptual planning and feasibility study

Design , specifications and engineering

Procurement , providing , implementing and construction

Startup for occupancy (utilizing , employing , investing or serving)

Operation , running and maintenance

Durability and utility of end use (fulfillment of project useful life)

Q 4

Conceptual Estimations

Conceptual estimation is (quick and simple) estimation , using available historical cost information and applying as parameters , an approximate or rough estimation can be prepared . These types of estimates are valuable in determining the order of magnitude of the cost for very rough comparisons and analysis , but are not appropriate for critical decision making and commitment .

Bill of quantity

Also referred to as (BOQ) is a most important formulated (tendering - contracting) documentaries in construction/building industry , prepared by the quantity surveyor or estimator (often a construction cost consultant) . Preparing a bill of quantities requires that the designs and set of drawings and plans are complete and specifications and involved standards and conditions have been specified .

Project Management

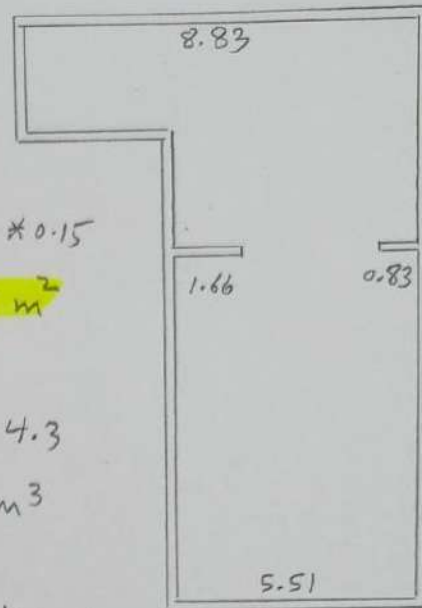
Is the application of processes , methods , knowledge and experience to (organize , plan , monitor and control) resources that are necessary for executing the project until a intended quality deliverable is produced .



Q5

area of the wall top projection =

$$[12.9 \times 2 + 8.83 \times 2] \times 0.15 + (1.66 + 0.83) \times 0.15$$
$$6.519 + 0.3735 = 6.8925 \text{ m}^2$$



Roughly volume of the walls = 6.8925×4.3

$$= 29.63775 \text{ m}^3$$

deducts of doors = $1.1 \times 1.935 \times 0.15 \times 2 +$

$$2.905 \times 2.58 \times 0.15$$

$$= 0.63855 + 1.124235 = 1.762785 \text{ m}^3$$

deducts of windows = $3.32 \times 1.29 \times 2 \times 0.15 + 1.245 \times 1.29 \times 3 \times 0.15$

$$= 1.28484 + 0.722723 = 2.00756 \text{ m}^3$$

1- Net quantity of wall masonry work =

$$29.63775 - 1.762785 - 2.00756 = 25.8674 \text{ m}^3$$

2- Roughly No. of block = $\frac{25.8674}{0.15 \times 0.2 \times 0.4} = 2155.6167$ blocks

actual required blocks = $\frac{25.8674}{0.15 \times 0.215 \times 0.415} = 1932.7468$ blocks

3- equivalent volume of Mortar Paste = $2155.6167 - 1932.7468$

$$= 222.8699 \text{ blocks}$$

Quantity of Mortar Paste = $222.8699 \times 0.15 \times 0.2 \times 0.4$

$$= 2.6744 \text{ m}^3 \text{ of cement-sand Mortar}$$

Extra notes:

External Evaluator