BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT

1.0 INTRODUCTION

The Bachelor of Science in Construction Management is a four (4) year full-time degree programme. The programme aims at providing the student with skills to manage the implementation of architectural and civil engineering design drawings, innovate implementation solutions which optimize use of resources and maximizes product quality and create successful construction business which can compete in the global market. The modern construction manager requires both technical and enterprise management competency and this course provide this necessary mix.

2.0 OBJECTIVES

The overall objective of the programme is to produce professionals who will be particularly competent to manage Building and Civil Engineering construction industry in a professional manner to ensure quality products. The specific objectives of the programme are:

a) To develop competence in students in applying technological solutions to contemporary construction industry problems.
b) To develop capacity of the students to address management challenges in building industry for enhanced efficiency and improved quality products.
c) To develop competence in students to research upon and create better building methods for effective and efficient utilization of resources.

3.0 ADMISSION REQUIREMENTS

Candidates must satisfy the minimum University entry requirements. In addition, they should meet the following requirements:

- Have at least a mean grade of C+ in the Kenya Certificate of Secondary Education (KCSE). In addition, candidates are expected to have obtained at least a grade C(Plain) or above in Mathematics, Physics, and Chemistry.

  Or

- Have two principal passes in science subjects in KACE and at least a credit in mathematics.

  Or

- Have Diploma or Higher Diploma in Construction Management, Building Technology, Civil Engineering or any other related discipline from a recognized university or college.

  Or

- Have a related degree from a recognized University.

4.0 COURSE STRUCTURE AND DURATION

a) The degree shall normally take four academic years of 8 semesters.

b) Courses shall be offered in units. A course unit is defined as that part of a subject described by a coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours of study in a semester. For this purpose one 1-hour lecture is equivalent to one 2-hour tutorial or 3-hour practical or any combination as may be approved by the Board of the School of Engineering Sciences

c) Part-time students shall be allowed to take not less than 50% of the courses prescribed for the year.

d) All course units will be taught for a total of 42 contact hours, including examinations except industrial attachment which will take 480 hours of practical work in a relevant industry.

e) Students shall be required to undertake Construction Management Industrial Attachment of 480 hours in third semester of second and third years of study.

5.0 CREDIT TRANSFER

Students may be exempted from some courses by University on recommendation of the School Board.

6.0 EXAMINATIONS REGULATIONS

University Senate Examinations rules and regulations shall apply.

7.0 COURSE LISTING

One semester shall comprise minimum of seven (7) units and a maximum of nine (9) units.

8.0 COURSE DISTRIBUTION

YEAR ONE SEMESTER ONE

Course Code	Course Title	Contact Hours		Total Contact Hours	Weight (Unit)
		Lecture	Practical		
TCM 3111	Engineering Drawing I	21	21	42	1C
TCM 3112	History of Construction	42	0	42	1C
SCH 3111	Inorganic Chemistry	28	14	42	1R
SMA 3111	Mathematics I	42	0	42	1R
EEL 3115	Communication Skills	42	0	42	1R
SBI 3114	HIV and AIDS	42	0	42	1R
SPH 3111	Physics I	28	14	42	1R
SCS 3111	Computer Organization and Application	28	14	42	1R
	Total	**273**	**63**	**336**	**8**

YEAR ONE SEMESTER TWO

Course Code	Course Title	Contact Hours		Total Contact Hours	Weight (Unit)
		Lecture	Practical		
TCM 3121	Material Science I	28	14	42	1C
TCM 3122	Engineering Drawing II	21	21	42	1C
TCM 3123	Physical Environment	28	14	42	1C
ERP 3125	Social Ethics and Integrity	42	0	42	1R
SMA 3121	Mathematics II	42	0	42	1R
SLB 3121	Development Studies	42	0	42	1R
SCH 3121	Organic Chemistry	28	14	42	1R
SPH 3111	Physics II	28	14	42	1R
	Total	**259**	**77**	**336**	**8**

YEAR TWO SEMESTER ONE

Course Code	Course Title	Contact Hours		Total Contact Hours	Weight (Unit)
		Lecture	Practical		
TCM 3211	Soil Mechanics	28	14	42	1C
TCM 3212	Building Technology I	42	0	42	1C

TCM 3213	Material Science II	28	14	42	1C
TCM 3214	Building Science	42	0	42	1C
TCM 3215	Workshop Technology I	21	21	42	1C
TCM 3216	Civil Engineering Construction I	42	0	42	1C
TCM 3217	Engineering Surveying I	28	14	42	1C
BBM 3211	Elements of Economics	42	0	42	1R
	Total	**280**	**56**	**336**	**8**

YEAR TWO SEMESTER TWO

Course Code	**Course Title**	**Contact Hours**		**Total Contact Hours**	**Weight (Unit)**
		Lecture	**Practical**		
TCM 3221	Building Technology II	42	0	42	1C
TCM 3222	Structures I	42	0	42	1C
TCM 3223	Civil Engineering Construction II	42	0	42	1C
TCM 3224	Building Services I	42	0	42	1C
TCM 3225	Workshop Technology II	21	21	42	1C
TCM 3226	Engineering Surveying II	28	14	42	1C
TCM 3227	Design Studio I	28	56	84	2C
	Total	**245**	**91**	**336**	**8**

YEAR TWO SEMESTER THREE

TET 3231: 480 Hours - Industrial Attachment

YEAR THREE SEMESTER ONE

Course Code	Course Title	Contact Hours		Total Contact Hours	Weight (Unit)
		Lecture	Practical		
TCM 3311	Structures II	42	0	42	1C
TCM 3312	Construction Project Planning and Control	42	0	42	1C
TCM 3313	Measurement for Construction Works I	42	0	42	1C
TCM 3314	Building Services II	42	0	42	1C
TCM 3315	Construction Economics	42	0	42	1C
TCM 3316	Design Studio II	28	56	84	2C
TET 3318	Research Methods	42	0	42	1R
	Total	**280**	**56**	**336**	**8**

YEAR THREE SEMESTER TWO

Course Code	Course Title	Contact Hours		Total Contact Hours	Weight (Unit)
		Lecture	Practical		
TCM 3321	Structures III	42	0	42	1C
TCM 3322	CAD Drafting in Construction Management	21	21	42	1C
TCM 3323	Building Technology III	42	0	42	1C
TCM 3324	Construction Plant & Equipment Management	42	0	42	1C
TCM 3325	Measurement for Construction	42	0	42	1C

	Works II				
TCM 3326	Design Studio III	28	56	84	2C
PES 3324	Sustainable Development	42	0	42	1R
	Total	**259**	**77**	**336**	**8**

YEAR THREE SEMESTER THREE

TET 3331: 480 Hours - Industrial Attachment

YEAR FOUR SEMESTER ONE

Course Code	**Course Title**	**Contact Hours**		**Total Contact Hours**	**Weight (Unit)**
		Lecture	**Practical**		
TCM 3411	Construction and Law	42	0	42	1C
TCM 3412	Site Organization and Management	42	0	42	1C
TCM 3413	Maintenance and Rehabilitation	42	0	42	1C
TCM 3414	Design Studio IV	28	56	84	2C
TCM 3415	Research Project I	14	28		1C
PES 3411	Environmental Impact Assessment and Audit	42	0	42	1R
BBM 3411	Cost Planning and Cost Control	42	0	42	1R
	Total	**252**	**84**	**336**	**8**

YEAR FOUR SEMESTER TWO

Course Code	**Course Title**	**Contact Hours**		**Total Contact Hours**	**Weight (Unit)**
		Lecture	**Practical**		
TCM 3421	Construction Contract Administration	42	0	42	1C
TCM 3422	International Construction	42	0	42	1C

	Practice and Procurement				
TCM 3424	Research Project II	14	28	42	1C
BEP 3441	Entrepreneurship Skills	42	0	42	1R
PSP 3426	Project Planning and Management	42	0	42	1R
BBM 3421	Organizational Theory	42	0	42	1R
BBM 3422	Financial Management	42	0	42	1R
PES 3421	Urban and Regional Planning	42	0	42	1R
		308	**28**	**336**	**8**

C: Core course, which is central to the discipline of study.

R: required course, which is supportive or beneficial to the programme.

9.0 DETAILED SYLLABUS

YEAR ONE SEMESTER ONE

TCM 3111: Engineering Drawing I **42 hours**

Technical drawing; Introduction, aspects: Various aspects of graphic language, Aesthetics, artistic and technical drawing equipment for pencil work and ink work, drawing paper sizes, lettering and line work, Geometrical constructions. Dimensioning procedures. Projections: types, orthographic to isometric and vice versa, oblique projections. Intersections of regular bodies. True shapes and development. Auxiliary views. Isometric and oblique representations, sections of cones – interpenetrations, developments. Free hand sketching. Conventional representation of features including British standard (BS) 308, international standard organization (ISO) 4500 and Kenya Bureau of Standards (KBS) codes of drawing practice.

TCM 3112: History of Construction **42 hours**

Introduction to the profession of construction. History of Construction from buildings and civil engineering perspective in early civilization in Europe, Africa, East Africa; the middle ages; Renaissance and Baroque; Romanticism; the Industrial Revolution and contemporary age.

SCH 3111: Inorganic Chemistry **42 hours**

Atomic structure: Bohrs theory. Wave nature of electrons. Quantum mechanical model of the Atom. Quantum numbers. Orbital shapes and energy, Qualitative consideration of the Schrodinger wave equation in deduction of s,p,d,f orbitals. Electron spin and the Pauli's exclusion principle. Hund's rule. Aufbau. Principle and the Periodic table: Periodic trends in atomic properties. Electronegativity, electron affinity and atomic radius. Octet rule. Chemical bonding: Ionic bond, Covalence, Co-ordinate valency, Valence- bond representation, Dipole-dipole interactions. Intermolecular forces. Intra-molecular forces, Van der-Waals radii, Hydrogen bonding. Valence Shell Electron Pair Repulsion (VSEPR) theory. Shapes of molecules. Multiple bond repulsion. Hybrid orbitals. Shapes of alkenes alkenes and alkyne molecules. Sigma and Pi- bonds. Simple MO bonding.

SMA 3111: Mathematics I **42 hours**

Elementary set theory. Mappings and functions: Definitions, domains, codomains, range and inverses and composition of functions. Trigonometry; Functions, their graphs, inverses, degree and radian measure, sine and cosine formulae, trigonometric identities and equations. Algebra: Quadratic equations. Surds, logarithms and indices. Series: Arithmetic and geometric progressions, Permutation and combinations. Binomial theorem and applications such as approximations, simple and compound interest. Remainder theorem applications to solutions of factorials polynomials. Statistics: Collection and representation of data. Measures of central tendencies and variability. Graphical and axiomatic approaches to probabilities. Tree diagrams probability: Definition, axioms, tree diagram.

EEL 3115: Communication Skills **42 hours**

Study skills; planning study time, making reference, filing notes; preparing for examinations. Library skills: organization; classification, shelving; using reference books, listening in lectures, speeches and instructions, understanding lectures, note taking, speaking skills, asking and answering questions in lectures and seminars, making and defending arguments, agreeing and disagreeing, explaining points clearly, academic reading skills, skimming and scanning, understanding footnotes and bibliographical references.

SBI 3114: HIV and AIDS **42 hours**

Introduction; historical background and magnitude of HIV and AIDS, general organization of the human body, reproduction, immune system (human physiology) and other factors; sex and sexuality; the biology of the human immunodeficiency virus and viral transmission; stages of infection and the development of HIV and AIDS; opportunistic infections; HIV and AIDS prevention and infection control; peer education for HIV; treatment options and vaccine development; blood transfusion and HIV and AIDS; management of HIV and related infections; legal and Ethical Issues in HIV and AIDS; Factors that influence the spread of HIV and AIDS in Africa; case studies in selected countries in Africa; HIV and AIDS as a national disaster impacts; myths and emerging issues on HIV and AIDS.

SCS 3111: Computer Organization and Application **42 hours**

Organization: Introduction to the computer and the notion of a programmable machine. The basic organization based on the von Neumann model. Functional components (CPU, memory, I/O) and their logical organization. Number systems and internal data representation. Concept software and types of software. Components of contemporary personal computer systems from end-user perspective. Application: Classical and contemporary applications of computers. Proficiency in basic computer usage and productivity/office automation applications including word- processing, spreadsheets, e-mail, web, etc. Basic first level security and maintenance issues. Ethical and societal issues.

SPH 3111: Physics I **42 hours**

Mechanics and properties of matter; vectors; rectilinear motion; projectile motion, Newton's laws of motion and their applications; composition and resolution of forces; uniform circular motion; Newton's law of gravitation: G (gravitational constant) and g (acceleration due to gravity); Simple harmonic motion; Determination of g; Conservation of energy and momentum; flow of liquids; Viscosity; Surface tension; Elasticity, elastic gases; Scales of temperature, gas and resistance thermometers; Perfect gas-absolute temperature; First law of thermodynamics, specific heat capacities of gases at constant pressure and volume; Kinetic theory of gases-derivation of the relation for pressure; Mechanism of heat transfer, coefficient of thermal conductivity; Black body,

Stefan's law; Sound: equation of wave motion; Velocity of sound in solids and fluids; Waves on a string; Relation between velocity and elasticity of the medium; Ultrasonics and their applications.

YEAR ONE SEMESTER TWO

TCM 3121: Material Science I **42 hours**

Properties of plain concrete, cements and aggregates. A systematic examination of the science and technology of cement, Moisture in aggregates. Sieve analysis, Specific gravity, and Water absorption in aggregates. Batching. Mixing. Transporting, placing and compacting of concrete. Behavior of concrete. Mix design. Consistency and low of concrete. Ultrasonic testing of concrete. Properties of ionising radiations, interaction with matter. Applications in radiography tracer techniques, in-situ density and moisture content determination. Masonry: building stone, blocks and brick types; properties, uses, deterioration, design. Mixes and properties of mortar. Quality control.

TCM 3122: Engineering Drawing II **42 hours**

Construction of thread forms, cams and gear profiles. Concepts and use of sectioning. Sectional views, elevations and projections. Designation, methods of representation and drawing of various types of fasteners and couplings. Assembly drawing. Jigs and fixtures; design drawing; joints. Free hand sketching.

TCM 3123: Physical Environment **42 hours**

Introduction to geology and its relevance to building and civil works. Structural geology; gorges, faults and joints. Ground water in relation to rocks and soils. Weathering; types and factors affecting weathering. Site investigation: ground investigation, laboratory investigation, sample and sampling. Quarrying: surface and underground excavation, rock reinforcing. Geological maps: map interpretation, field mapping.

ERP 3125: Social Ethics and Integrity **42 hours**

Definitions and concept of ethics; categories of Ethics; National cohesion; Integrity; Unity; Structural Injustices; Ethnicity: Positive Ethnicity, Negative Ethnicity; Peace: Peace Making, peace Building, peace Transformation; Stake Holders in National Cohesion.

SMA 3121: Mathematics II **42 hours**

Coordinate geometry and equations of straight lines. Matrices: Definitions, matrix algebra, determinants, transpose, adjoints, inverses and solutions of systems of linear equations using matrix method. Limit continuity. Differentiation and integration of algebraic, trigonometric, exponential functions. Applications of differentiation and integration to rates of change, maxima, minima. Area under curve. 1^{st} order D.E and their application.

SLB 3121: Development Studies **42 hours**

Development studies as an autonomous discipline; the concept of development; an overview of the theories and paradigms of development; the relationship between economic growth and development; science and technology in development; developed and developing countries; issues in development: social, economic and political; actors in development: the state, national and international NGO's, bilateral and multilateral institutions, multinational corporations (MNC's) and social movements.

SCH 3121: Organic Chemistry **42 hours**

The uniqueness of carbon in the periodic table and catenation. Bonding in carbon compounds including sp, sp^2, sp^3, hybridization. Elementary structural elucidation, calculations of empirical and molecular formulae, double bond equivalents. The occurrence, nomenclature structural isomerism, physical and chemical properties of alkanes, cycloalkanes, alkenes, alkynes. Alky halides, alcohols, carbonyl compounds, carboxylic acids, alkyl amines. Reaction mechanisms: Substitution, elimination.

SPH 3121: Physics II **42 hours**

Electricity and magnetism: Properties of magnetic materials and their uses; Direct and alternating current; Heating effect of current; Thermoelectricity. Domestic appliances: Plugs; Heaters; Electric iron; Cookers; Refrigerators. Optics: Review of mirrors and lenses; Ray tracing; Defects in lenses; Optical instruments; Interferences and polarization. Elementary spectroscopy: Solar spectrum; Spectroscopy of atmospheric gases and biomolecules; Ozone filter; Photo electricity: Kinetic energy of photoelectron; Work Energy levels. Explanation of atomic spectra; X-ray spectra; structure of the nucleus; Radioactivity: application; Introduction to nuclear fission; Fusion and nuclear energy.

YEAR TWO SEMESTER ONE

TCM 3211: Soil Mechanics **42 hours**

Origin and composition of soils. Soil structure. Physical and mechanical properties of soil. Soil classification:. Water in soils, capillarity, shrinkage, stress, permeability, seepage, flow nets, compressibility and consolidation. Effective stress, rate of consolidation, vertical stress and settlement. Stability and failure: Shear strength in soils, bearing capacity. Soil stabilization: mechanical and chemical. Site investigations: reconnaissance, sampling, field test Ground investigations piles, shallow and deep. Construction methods in various soils types: retaining walls, sheet piles, dewatering and drainage, filter media.

TCM 3212: Building Technology I **42 hours**

Site preliminaries; characteristics of clearance, setting out, notice and licences, temporary services, storage of materials, site offices and structures, Demolitions, notices and license, methods, requirements and adjoining structures.

Building: functions, forms and structural concepts, materials and building performance. Forces on a building: live dead, wind and seismic loads. Building elements: types of foundations, strips, raft. Walls; masonry, monolithic, frame, membrane. Roofs; pitched, flat, construction detail, covering and waterproofing. Floors: solid floors and timber floors construction details. Building components: Window types functions and construction details on wall openings. Doors: types, functions and construction details on wall openings. Fixtures, wardrobe, cupboards, kitchen tops. Methods of building: traditional, conventional, rationalised, system.

TCM 3213: Material Science II **42 hours**

Timber: nature and properties of wood, seasoning and effect of moisture, defects, testing, grading. Basic and allowable stresses, durability and preservations, uses, fire resistance. Steel: methods of manufacture, types, properties, uses, methods of working, heat treatment, welding, defects and fatigue. Introduction to Polymers and Plastics: types, properties and deteriorations. bituminous materials, asbestos, ceramics and plant based materials, classification and specifications. Storage, handling, testing and treatment. Waste handling.

TCM 3214: Building Science **42 hours**

Thermal units and heat transfer. Thermal physical properties of materials –. Building orientation and solar movement, green house effect. Principles of, outdoor and indoor climate. Heat flow within buildings. Sun protection. orientation and shading. Acoustics: Properties of sound, behaviour of sound, room acoustics and reverberation time in auditoria, noise control outdoors and indoors and material testing. Sound insulation, noise criteria of building materials prediction methods and calculations. Lighting: Natural and artificial lighting. Lighting external and internal spaces for the built environment. Calculation of daylighting,. Protractors and nomogram for sun angles. Lighting design and specifications.

TCM 3215: Workshop Technology I **42 hours**

Masonry works: Manufacture of concrete blocks, bricks, stone dressing. Return angles; jointing and bedding of construction materials. Setting out. Partitioning. Cut stone, dressing and laying. Precautions. Creating opening in masonry walls. Fixtures and fittings to masonry walls. Tools and quality of workmanship. Workshop practice. Appropriate technology manufacture of compressed stabilised earth blocks, sisal cement, roofing sheets and tiles, water storage tanks and new products. Carpentry: Use of carpentry tools and machines, types of timber. Timber joints, exercise in joinery work quality control. Timber trusses, door frames and doors. Timber floors: Parquet, wood block, boarding.

TCM 3216: Civil Engineering Construction I **42 hours**

Construction processes and equipment**:** Steel construction. Single reinforced and pre-stressed concrete works. Earthworks. Rock evaluation and crushing. Foundation piles. River and offshore works. Civil Engineering works: Design; construction; and production of elements and components including: Retaining walls and basements, Tunnelling, Water storage tanks and silos, Dam construction.

TCM 3217: Engineering surveying I **42 hours**

Introduction to surveying: definitions and basic concepts. Linear measurements: ranging of line, monumentation of points; instruments and tools, chains, steel bands, tapes, corrections, accuracies. Electromagnetic Distance Measurement (EDM): basic principles, uses, accuracies. Detailed surveying of direct linear measurement. Measurements of differences in heights; geometric

levelling: principles, differential levelling, reciprocal levelling, procedures, levelling instruments, telescopic, levelling tube, booking, calculations, theory of errors, corrections, accuracies. Applications: contouring, methods guide, radial line, cross and longitudinal sections, site levelling. Field work.

BBM 3211: Elements of Economics 42 hours

Introduction: Nature and scope of economics: Micro and Macroeconomics; Basic economic concepts: e.g. scarcity, choice,oportunity cost and scale of preferences; Theory of consumption and utility analysis: Law of Diminishing marginal utility; Theory of production: meaning of Production, factors of Production; Production cost Price theory: Demand and Supply:- meaning,types,determinants and elastisties;Markets market structures; Price determination in different market structures; Economic role of governments; National Income accounting(NIA):Measurement of national income,importance of NIA statistics; Income Determination theory, theory of consumption theory of saving and Investment;Demand for supply of money; Commercial Banks and Credit Creation; Role of Central Banks; International trade:theory of comparative advantage; Balance of payments Accounts;the case for and against free trade ;Commercial policies;Foreign exchange and foreign exchange rates;Economic Growth;unemployment;inflation;macro-economic policies:monetary,fiscal and income policy.

YEAR TWO SEMESTER TWO

TCM 3221: Building Technology II 42 hours

Formwork and false work: Selection, construction, performance and applicability. Construction of buildings using framed structures: Multi-storey frames, structural materials, performance under loads, movements/expansion joint. Pads and pile foundations, underpinning, dewatering, retaining walls, basements and taking. Suspended floors: Types performance and construction details. Concrete flat and pitched roofs, construction and water proofing details. Concrete stars: Types, construction details. Cladding, precast units, prefabrication and assembly

TCM 3222: Structures I 42 hours

Concept of structure in Buildings. Fundamental influence concept of forces and loads. Statics: systems, resultants and equilibrium of forces. Structural forms and their identification. Free body

diagrams. Bending structures: Shear force and bending moments diagrams for simply supported beams. Determinate frames: Shear force, bending moments, thrust force diagrams and deflected shapes. Analysis of determinate trusses. Shear stress. Analysis of simple trusses. Bending in structures: shear force and moment diagrams. Bending stresses. Deflection in beams; direct integration, virtual force area, conjugate beam and virtual force methods. Influence lines for statically determinate structures.

TCM 3223: Civil Engineering Construction II **42 hours**

Roads: Rigid and flexible Construction techniques; cut and fill, surfacing, drainage systems. Base construction; stabilization using cement, lime, and bitumen, labour intensive techniques, stage construction, construction materials; aggregates, bitumen. Introduction to road maintenance and construction plant., Railway and platforms, Sea embankments, Drenching, Piers, Light house.

TCM 3224: Building Services I **42 hours**

Provision of water: Basic cold water supply, hot water supply, storage, distribution and drainage. Plumbing: Types of pipes, sizes, quality, properties, joints; and bending machines. Cold and hot water pipe systems. Special Plumbing: Steam pipes; compressed air pipes; refrigeration pipes and their covers. Air-conditioning ducts and covers. Drainage: Drain laying and pipe jointing; manholes and inspection chambers; drain testing systems. Refuse disposal systems: Chutes, incinerator, garchery systems, macerator equipment. Solid waste and soil drainage disposal.

TCM 3225: Workshop Technology II **42 hours**

Workshop practice in joinery and mass production. Metal workshops: Use of tools and machinery, cutting and bending of metals, welding, riveting, bolting., ironmongery. Use of stock and dies; threading and joining galvanised mild conduits. Plastic pipes, cutting and joining techniques pipe bending, springs, machine bedding.

TCM 3226: Engineering survey II **42 hours**

Traversing: Theodolite observations: horizontal and vertical angles, errors and accuracies. Methods of point fixation: design, order, observations, computations, errors and accuracies of traverses triangulation, trilateration, trigonometric levelling, intersection, resection and combination of methods. Tacheometry: principles of optical distance measurements, stadia method, field

procedures and booking. Differences in heights, instruments, reductions. Total station. GPS surveying. Fieldwork.

TCM 3227: Design Studio I **84 hours**

Planning and design of single storey building. Candidate to provide design drawings.

YEAR TWO SEMESTER THREE

TCM 3231: Industrial Attachment **480 hours**

Minimum of eight weeks of attachment to an appropriate construction workshop for hand-on practical training. During the Industrial Attachment, students will work under workshop supervisor. Students will maintain a logbook of daily activities and will be required to submit a comprehensive final report for assessment at the beginning of the following semester. Students will be visited at their work regularly by their Lecturers.

YEAR THREE SEMESTER ONE

TCM 3311: Structures II **42 hours**

Reinforced concrete design: strength method of design and analysis of reinforced concrete members such as beams, columns, one-way and two-way slabs, footings, shear, torsion, bond length and bar cutoffs. Specifications and details of reinforcement placing. Prestressed concrete: elastic analysis, design of prestressed concrete members, exploration of proestrus losses, camber and deflection, flexural and shear analysis, pre-tensioned and post- tensioned members. Reinforced Concrete (R.C.) and precast Concrete (P.C.) beams.

TCM 3312: Construction Project Planning and Control **42 hours**

Project Management: Introduction to operation research, linear programming, decision theory, inventory models, stochastic simulation. Principles of construction planning: Arrow and precedence diagrams, critical path method, resource allocation and levelling and time-cost trade off, project evaluation and resource techniques, computer application.

TCM 3313: Measurement for Construction Works I **42 hours**

Introduction to quantity surveying; methodologies of measurement including the standard method of measurement(SMM) ; working up processes; measuring of simple building elements of single storey buildings: superstructure; brickwork/stonework; foundations; earthworks; roofs and rainwater goods; internal and external finishes; windows, doors, plain openings and adjustments.

TCM 3314: Building Services II **42 hours**

Electrical installation; wiring facilities and ducting. Electrical: Electrical symbols, circuit diagrams layout interpretation, documentation, electrical wiring systems: lighting installation circuit; ring main power socket; bell circuit. Testing wiring systems. Fire detection. Mechanical systems, pumps sizes and location. Provision of specialised services such as lifts, escalators and ventilation, air conditioning and refrigeration. Fire protection: means of escape, fire regulations, grading, resistance, fire detection and fighting facilities.

TCM 3315: Construction Economics **42 hours**

Construction and its place in the economy; the structure of the industry, types of work and specialisation. Trends in output, prices and financing. The special characteristics of construction; sources of demand, fluctuations in output, importance of investment. Marketing construction; property investment. Price determination. Production: firm analysis, planning, input/output analysis. Finance: sources, money and banking stock market. Marketing: principles and practices, problems, advertising and sales promotion. Investment: types and appraisal methods. Feasibility and studies: components, preparation and presentation.

TCM 3316: Design Studio II **84 hours**

Taking quantities and costing and development of construction schedule using project management software of a given architectural building of at least three floors.

TET 3318: Research Methods **42 hours**

History of scientific theory; paradigm shifts; experimental methodology and the scientific method. Research designs: complete randomization, Randomized block designs: representative Sampling. Proposal writing: statement of the problem, purpose of study, specific objectives;

research assumptions; research hypothesis, literature review, experimental methodology design. Analysis of data; student t-test, multiple comparisons, use of computers in data analyses, report writing and presentations.

YEAR THREE SEMESTER TWO

TCM 3321: Structures III **42 hours**

Steel design: design and analysis of steel systems using elastic analysis to include tension members, columns, beams, beam-column connections, bolted connections, welded connections, structural systems. Timber design: design and analysis of timber structures by elastic methods to include tension members such as columns, beams, beam-column connections, bolts, nails, plywood diaphragms and glue laminated members.

TCM 3322: CAD Drafting in Construction Management **42 hours**

Getting started; Setting up the drawing Environment; Using commands and system variables; Using coordinate systems; Creating objects; Drawing with precision; Controlling the drawing display; Editing methods; Using layers and object properties; Adding text to drawings; Creating dimensions; Using blocks and external references; Managing content with AutoCAD design Centre; Creating a layout to plot; Plotting your drawing; Working in three-dimensional space; Creating three-dimensional objects. Use of ArchiCAD. The benefit and limitations of CAD.

TCM 3323: Building Technology III **42 hours**

Use other newly emerging building materials in construction e.g. use of glass, rubbers and adhesives in building construction. Finishes: Internal and external, types, properties functions, performance, applications and construction methods. Paints and paintwork: Purpose and types, methods and application to various backgrounds, Iron mongery: Materials and finishes, classification and schedules. Timber Stairs: Types, construction and balustrades. Fireplaces, Chimneys and flues; Construction and finishes. Building code.

TCM 3324: Construction Plant & Equipment Management **42 hours**

Construction and pumping equipment: Selection, performance and application of equipment. E.g. scrapers, dozers, cranes, etc., based on applications, methods, and production requirements.

Methods for construction of projects and related equipment, including earthmoving, paving, steel and concrete construction, formwork, trenching, cofferdams, rock excavation, new technologies in setting out, tunneling, site preparation and organization. Deep excavation procedures and necessary equipment related to support of excavation systems, methods of installation and dewatering. Concreting methods and necessary equipment including mixing, delivery, and placement. Power generation, transmission, and output capacity of equipment engines. Calculation of transport cycle times.

TCM 3325: Measurement for Construction Works II 42 hours

Taking off exercises, abstracting and billing using the Civil Engineering standard method of measurement (CESMM) for; earthworks, roadworks; tunnelling; concrete work; pipeworks; steelwork; basement, retaining walls and aunxilliary works. Alternative methods of measurements. Preparation of Civil Engineering bills of quantities and pricing convention. Use of IT in measurements. Estimating and costing of construction works.

TCM 3326: Design Studio III 84 hours

Design of plumbing system of a given architectural building of at least three floors including quantification and costing.

PES 3324: Sustainable Development 42 hours

Definitions of sustainable development; priorities for development; conditions for sustainable development; the concepts of weak sustainability and strong sustainability; measuring sustainable development. Precautionary principle and Sage Minimum standards; role of technological change; population growth and international trade in sustainable development; sustainable development; sustainable livelihoods; operational principles for sustainable development.

YEAR THREE SEMESTER THREE

TCM 3331: Industrial Attachment 480 hours

Minimum of eight weeks of attachment to an appropriate construction industry for hand-on practical training. During the Industrial Attachment, students will work under company supervision. Students will maintain a logbook of daily activities and will be required to submit a

comprehensive final report for assessment at the beginning of the following semester. Students will be visited at their work place twice by their Lecturers.

YEAR FOUR SEMESTER ONE

TCM 3411: Construction and Law 42 hours

Sources of Law. Company Law: Nature of a Company, financing of a Company; shares, assets, liabilities and bankruptcy; directors and meetings, partnership and limited Companies. Law and land: Rights and duties of owners and occupiers of land, lease, control of land, fixtures and dilapidations, easements and profits, restrictive covenants and licenses. Contract Law: Types of contracts: simple contracts, contracts under seal; essentials of a valid contract. Terms of contracts; Agreement and schedule of conditions of building contract. Contract discharge. Commercial Law: General principles of purchase and sale of goods. Labour Law: Basic principles of individual employment contract; collective labour law including collective bargaining; settlement of labour disputes. Dispute resolution: Arbitration, mediation and conciliation. Damages; quantum merit, specific performances. Law of torts: Nature of torts, negligence, vicarious liabilities, defense and remedies.

TCM 3412: Site Organization and Management 42 hours

Regulations and safe working conditions on site, Site layout planning, material and equipment layouts, Statutory registers, diaries, statutory inspections, first aid, preliminary site works, siting temporary buildings, temporary housing at site, access roads, other temporary site services, labor assessment and forecasts, work study, disaster management and dispute resolution techniques**,** **o**verview of current status of occupational Health and safety at construction sites, types of pollution in construction work places, disasters and mitigation measures in construction, rescue operations, occupational health acts and regulation. Environmental audits at construction sites.

TCM 3413: Maintenance and Rehabilitation 42 hours

Inventory of problems for common construction materials, Non destructive testing techniques, Dimensional instability analysis during rehabilitation. Principles and techniques for structural repairs. Inspection report on the condition of buildings; specification, measuring and pricing. Statutory provisions relating to repairs and maintenance, habitability of the built environment and demolitions. Application of cost in use. Maintenance programming and budgeting.

Estate Management: Management of residential, commercial and industrial properties; selection of tenants, restrictive covenants, tenancy agreements and their termination.

TCM 3414: Design Studio IV **84 hours**

Based on a given Design drawing of civil engineering infrastructure systems such as roads, drainage, sewer systems etc, candidate to carry out; quantification and costing; and construction programming.

TCM 3415: Research Project I **42 hours**

Developing a research proposal within the field of Construction Management under staff supervision will be carried out by the student. In this course students will submit a research proposal complete with preliminary designs and present the report before a panel of Departmental examiners.

PES 3411: Environmental Impact Assessment and Audit **42 hours**

Legal principles and institutional framework: EIA as a management tool. Basic concepts; preliminary activities; impact identification (scooping); baseline study; impact evaluation (quantification); mitigation measures; assessment; documentation; decision making; post auditing; falsehoods surrounding EIA. Strategic Impact Assessments: Social Impact Assessments: Health Impact Assessments: Problems and solutions of EIA institutional arrangements. Nature of environmental auditing; role of environmental auditing in environmental policy process; the need for environmental auditing; tools for environmental auditing; categories of environmental stock; critical and environmental audits. National accounts: problems and resource depletion.

BBM 3411: Cost Planning and Cost Control **42 hours**

Expenditure planning and control: Expenditure planning: preparation, use and accuracy of anticipated expenditure profiles. Real time cost analysis; modification of predictions and effects, cost and value reconciliation; value and losses accounting procedures; overheads and profits. Expenditure control: Contractual payment clauses and deductions, fluctuations and increased cost variations and valuation, preparation of final accounts. Formulation, determination and settlement of contractual claims, disruptions and direct loss.

YEAR FOUR SEMESTER TWO

TCM 3421: Construction Contract Administration 42 hours

Organization of the construction industry. Responsibilities of the contractor and relationship with the engineer as the lead consultants from inception of a project to handing over Contract Basics. Standard forms of contracts Bidding procedures. Payment certificates and final accounts. Surety bonds and insurance. Contract basics and legal disputes. Arbitration.

TCM 3422: International Construction Practice and Procurement 42 hours

Theories of international trade, modes of entry into foreign markets, international bidding and contract administration, mobilization planning, international human resource management, international production and logistics management, international finance management.

TCM 3423: Research Project II 42 hours

Carry out research based on the approved research proposal, document the findings, present the research findings before a panel of departmental examiners and submit a completed research project report for final examination.

BEP 3441: Entrepreneurship Skills 42 hours

Meaning of entrepreneurship. Importance of entrepreneurship in an economy. Basic requirements for starting and running an enterprise. Micro and macro constraints to entrepreneurship development and growth. Government policy on entrepreneurship in Kenya. Enterprise support system in Kenya. The policy framework of the success of East Asian and Israel enterprise success. Technology and Industrial growth: impact of technology on small scale enterprise. Accounting for entrepreneurs. Current key issues in entrepreneurship in Kenya. Case studies of managing small business. Basic taxation for business.

PSP 3426: Project Planning and Management 42 hours

Concepts of project management; project definitions; project charter; identifying phases; designating milestones; project schedule; tasks and milestones; dependencies; setting and assigning calendars; task durations; task sequence; allocating resources; setting and viewing dates; choosing attributes; adding costs and incomes; printing. Project monitoring; reviews of

schedules; adding data; comparisons; checking progress, fine tuning; sub-projects; data search; producing reports; with other productivity tools. Application of computers in project planning and management. Design, technology and procurement. Risk management. Project scope management; Methods of selecting and evaluating projects. Work breakdown structure; network planning and scheduling; schedule control.

BBM 3421: Organizational Theory 42 hours

Definition of organization, Organizational behavior and management theory, organizational structures and applications in construction, individuals in organizations, groups and group behavior, organizational change: theory of change, organizational behavior and strategic management.

BBM 3422: Financial Management 42 hours

The conceptual fundamentals of accounting. Financial state and financial results. Tangible and intangible assets. Accounting policy. The processing of accounting data. Accounting systems. Accounting conventions. Application procedures in the compilation of financial statements of constructing firms and manufacturing enterprises, accounting aspects and prescriptions of different enterprise forms. Introduction to the analysis and interpretation of financial statements, Budget estimates, cash-flow schedules and financial statements and the handling of contract accounts. The application of cost-accounting, budgets and cash-flow schedules, and financial statements in general financial management.

PES 3421: Urban and Regional Planning 42 hours

Definition of an urban region, urban facilities and infrastructure, design with reference to light, shade, perspective, proportion, composition and texture in urban environments; outdoor furniture, building materials, plot ratios and densities, building heights, road networks, new towns; urban land use.

Theory of a region; regionalization; delineation of a region; planning regions; theory of location and land use; integration of regional economic and regional development physical planning.