

Programme Contents of the Department of Project Management and Technology, School of Logistics and Innovation Technology (SLIT)

1.0 INTRODUCTION

Economic growth and development of nations to a large extent has depended on the provision of basic infrastructure that supports production activities. Effective development of infrastructure in an economy, however is a function of efficiency of Project Management practices (design, development and implementation). The risk of successful projects' delivery most often correlates strongly with its technical, technological and socioeconomic complexities. Interestingly, effective application of technology provides seamless mechanisms for managing the projects' complexities. Hence there is an increasing demand for trained manpower that are technically, technologically and managerially knowledgeable and skilled to work as project management professionals in all sectors of the economy (construction, industrial, communications, energy, communication, information technology, solid mineral development etc) of the Nigerian economy.

The B. Tech Project Management and Technology (PMT) is designed to provide a sustainable platform for training and development of critical human capital needed for effective projects' delivery in Nigeria and the world at large. The Project Management and Technology Programme is a blend of Science, Engineering, Technology, Mathematics (STEM) and Management based disciplines. On completing the programme, students will be able to apply technology to: designing, planning, implementing, controlling, monitoring project processes as well as carrying out post-projects impact assessments and evaluations.

The Bachelor of Technology (B. Tech.) programme in Project Management and Technology is in an interface between STEM and Operations Management that strategically provides a blend of multi-disciplinary technical and techno-managerial knowledge and skills that enables its graduates, be multi skilled and talented.

The programme is designed to ensure that aside having broad based knowledge theories, principle and practices of Project Management, student must have an area of concentration, which includes: Construction, Industrial, Communication Technology or Energy/Power projects.

2.0 PHILOSOPHY, VISION, MISSION, GOALS AND OBJECTIVES

PHILOSOPHY

The philosophy of the B. Tech, Project Management and Technology programme is to be driven by excellence and international best practices in offering scalable human capital development academic programme in Project Management and Technology, leading to production of graduates possessing disruptive cutting-edge technical, technological and innovative skills for effective participation in National and global Project Management Systems and Operations for sustainable development.

VISION

The vision of B. Tech Project Management and Technology is to be a renowned global academic programme of choice for those seeking excellent scientific undergraduate training in Project Management, as well as allied disciplines.

MISSION

The philosophy of the B. Tech, Project Management and Technology programme is to be driven by excellence and international best practices in offering scalable human capital development programme in

Project Management and Technology, leading to production of graduates possessing disruptive cutting-edge technical, technological and innovative management knowledge and skills for effective participation in National and global efforts for sustainable development.

AIMS:

The aims of the B. Tech Project Management and Technology programme include:

1. To produce knowledgeable and competent manpower in relevant areas of Project Management and Technology, capable of designing, developing, planning, implementing, monitoring and controlling project systems and operations in private and public sector organisations.
2. To produce technical and technology savvy Project Management and Technology professionals capable of identifying and taking advantage of opportunities in the project management value chain of Nigeria and world at large.
3. To produce knowledgeable and highly skilled manpower who are adequately equipped to participate in the formulation, implementation and enforcement policies, rules and regulations governing the practice of Project Management and Technology professions in Nigeria.
4. To produce technical and technology savvy Project Management and Technology entrepreneurs capable of identifying and taking advantage of opportunities in the project management value chain of Nigeria; thereby creating jobs and value for society.
5. To provide results of scientific researches in the relevant areas of Project Management and Technology ecosystem to all stakeholders for effective professional practices.

3.0 OBJECTIVES OF THE PROGRAMME

The objectives of the B. Tech Project Management and Technology programme includes:

1. To educate and train graduates in the theories, principles and practices of Project Management as applied to construction, industrial, communication technology and energy/power sectors of the Nigerian economy.
2. To expose graduate to the diverse knowledge areas require for effective practice of project management and Technology profession, through broad-based multi-disciplinary exposure to curriculum that cuts across science, engineering, technology, mathematics, operations management and entrepreneurship areas.
3. To produce graduates with diverse knowledge, multi-skilled and multi-talented; capable of being innovators and solvers of complex problems of project management and technology systems and operations.
4. To develop the entrepreneurial knowledge, skills and exposures of graduates for creativity, value creation and employment generation within national and international socioeconomic environments.
5. To initiate, carry out and disseminate results of scientific researches aimed at finding solutions to problems of Project Management and Technology Professional practices for enhanced projects delivery in Nigeria.

4.0 JOB OPPORTUNITIES FOR GRADUATES OF THE PROGRAMME

The B. Tech Project Management and Technology programme when successfully completed will prepare students to be gainfully employed as employees in Project Management related operations of organization or be self-employed to provide Project Management supports services to organisations virtually in all sectors of the economy where Programmes, Projects, and allied Operations take place. Specifically, graduates of the programme can function as project technical managers with responsibility for designing, developing, planning scope, time, quality and cost, controlling, monitoring, evaluating as well as impact assessors of projects in private, public and non-governmental sectors of the economy. The services of the graduates of this programme are needed in the following sectors, industries and organisations:

- Construction.
- Industrial/Manufacturing
- Communication and Information Technology
- Energy/Power sector
- Mining and Solid minerals development
- Environment
- Financial Services.
- International organizations (World Bank, USAID, UNICEF, WHO, AFDB, EU etc).
- Oil and Gas.
- Public Sector.
- Private Sector
- Academia.
- Commerce and General Services
- Non-Governmental/Non-Profit

ENTRY REQUIREMENT INTO THE PROGRAMME

Admission into the B. Tech Project Management and Technology programme would be by either through the University Matriculation Examination (UME) or through Direct Entry.

ADMISSION THROUGH UME

In addition to an acceptable pass JME, candidates must have passed at least five (5) papers at (OL) at Credit Level from any of the approved public examination bodies in Nigeria in not more than two sittings. The required subjects are English Language, Mathematics, Physics, Chemistry and Economics, Biology/Agricultural Science, and Geography. The passes must be from the same examination body.

DIRECT ENTRY REQUIREMENTS

In addition to the five papers at the ordinary level for the UME candidates, direct entry candidates must possess three (3) requisite papers at Higher School Certificate (HSC) or GCE. Advanced level or OND or HND in appropriate areas preferably at Upper Credit Levels. Holders of OND are eligible for admission into year II provided that their programmes cover certain basic courses offered in the department up to the second year. Mostly students from Project Management and Technology related programs, Mechanical, Chemical, Polymer Engineering, Quantity Surveying, Building, Estate Management, Architecture, Project Management, Urban and Regional Planning, Civil Engineering. While HND holders are eligible for admission into year III depending on the appropriateness of their requisite academic qualification.

Inter-University Transfer Mode

Students can be admitted through this mode into 200-Level of the programme, provided they have the requisite O- level qualifications as prescribed above and a minimum CGPA of 2.00. Students who transfer from other universities shall be credited with only those courses deemed relevant to the programme, which they have already passed prior to their transfer. Such students shall however be required to pass

the minimum number of units specified for graduation for the number of sessions there are left to spend in the Faculty. Thus, no student on transfer shall spend less than six semesters (3 sessions) in order to earn a degree. Students who transfer from another programme in the Faculty for any approved reason shall be credited with those units passed that are within the curriculum of the programme they had transferred. Appropriate decisions on transfer cases shall be subjected to the approval of Senate on the recommendation of the Faculty Board.

5.3 Programme Structure

The structure of the B. Tech Project Management and Technology programme is multi-disciplinary and consists of four integrated components of:

Sciences, Engineering, Technology & Mathematics (STEM) –	70%
Innovation Technology/Operations Management/Entrepreneurship -	20%
Humanities /General Studies -	06%
Industrial Work Experience/Internship -	04%

6.0 COURSES STRUCTURE, PROGRAMME AND OUTLINES

Year One (100 Level) Harmattan Semester

Course Code	Course title	L	T	P	Unit
MTH 101	Elementary Mathematics I	3	1	0	4
PHY 101	General Physics I	2	1	0	3
PHY 107	General Physics I Practical	0	0	1	1
CHM 101	General Chemistry I	2	1	0	3
CHM 107	General Chemistry I Practical	0	0	1	1
ENG 101	Workshop Practice I	0	0	1	1
ENG 103	Engineering Drawing I	0	0	1	1
GST 101	Use of English I	2	0	0	2
GST 103	Humanities	1	0	0	1
BIO 101	General Biology 1	1	1	0	2
BIO 107	General Biology 1 Practical	0	0	1	1
Electives: Any one (1) of the following					
IGB 101	Use of Igbo Language I	1	0	0	1
FRN 101	Use of Use of Igbo Language I	1	0	0	1
Total					22

Year One (100 Level) Rain Semester

Course Code	Course Title	L	T	P	Unit
MTH 102	Elementary Mathematics II	3	1	0	4
PHY 102	General Physics II	2	1	0	3
PHY 108	General Physics II Practical	0	0	1	1

CHM 102	General Chemistry II	2	1	0	3
CHM 108	General Chemistry II Practical	0	0	1	1
ENG 102	Workshop Practice II	0	0	1	1
ENG 104	Engineering Drawing II	0	0	1	1
GST 102	Use of English II	2	0	0	2
GST 108	Social Sciences I	1	1	0	2
GST 110	Science, Technology & Society	1	0	0	1
Electives: Any one (1) of the following					
IGB 102	Use of Igbo Language II	1	0	0	1
FRN 102	Use of French II	1	0	0	1
Total					21

Year Two (200 Level)

Harmattan Semester

Course Code	Course Title	L	T	P	Unit
STA 211	Introduction to Statistics & Probability	2	1	0	3
CSC 201	Computer and Applications I	2	1	1	4
ENG 201	Workshop Practice III	0	0	1	1
GST 201	Social Science II	1	0	0	1
LIT 201	Economics I (Microeconomics)	2	0	0	2
LIT 203	Introduction to Logistics	2	0	0	2
ENG 209	Engineering Thermodynamics I	1	0	1	2
ENG 213	Engineering Mechanics I (Statics)	1	0	1	2
ENG 207	Introduction to Engineering Materials I	1	0	1	2
Electives					
Elective 1: Any one of the following					
*ENG 203	Engineering Drawing III	1	0	0	1
*ARC 201	Introduction to Architecture	1	0	0	1
Elective 2: Any one of the following					
MTH 203	Elementary Differential Equations I	2	1	0	3
MTH 201	Mathematical Methods I	2	1	0	3
Total					23

*Construction Projects Option takes ARC 201

*Industrial Projects, Energy Projects and Communication Technology Projects Options takes ENG 203

Year Two (200 Level)

Rain Semester

Course Code	Course Title	L	T	P	Unit
CSC 202	Computer and Applications II	1	1	1	3
MTH 202	Mathematical Methods II	2	1	0	3

LIT 204	Introduction Accounting & Finance	2	0	0	2
LIT 202	Economics II (Macroeconomics)	2	0	0	2
CIT 202	Computer Programming I	1	0	1	2
LIT 206	Introduction to Innovation Technology	2	0	0	2
PMT 202	Introduction to Project Management & Technology	2	0	0	2
SIW 200	Industrial Attachment/Internship (Long Vacation)	0	0	2	2
Electives:					
Elective 1: Choose any one (1) from the following					
*ENG 206	Workshop Practice IV	0	0	1	1
*BLD 206	Building Workshop Practice	0	0	1	1
Elective 2: Choose any two (2) from the following					
ENG 226	Introduction to Electrical and Electronics	2	0	1	3
ENG 208	Introduction to Engineering Materials II	1	0	1	2
ENG 224	Engineering Mechanics II (Dynamics)	1	0	1	2
Total					23/24

*Construction Projects Option takes BLD 206

*Industrial Projects, Energy Projects and Communication Technology Projects Options takes ENG 206

Year Three (300 Level)

Harmattan Semester

Course Code	Course Title	L	T	P	Unit
ENS 301	Introduction to Entrepreneurship and Innovation	1	0	1	2
LIT 301	Introduction to Business Law & Contract	2	0	0	2
LIT 303	Engineering Economy	2	0	0	2
PMT 301	Quality Management & Reliability	1	1	0	2
LIT 305	Industrial Psychology & Ergonomics	2	0	0	2
Electives					
Elective 1: Choose any one (1) from the following					
*ENG 305	Strength of Materials	2	0	1	3
*ENG 309	Fluid Mechanics I	2	1	0	3
Elective 2: Option Area Compulsory					
Industrial Projects Option					
PMT 303	Facility Design & Sustainability	1	1	0	2
MEE 303	Manufacturing Processes I	2	1	0	3
PMT 307	Product Design & Development	1	1	0	2
Total					20
Construction Projects Option					
ENG 315	Principles of Engineering Survey & Photogrammetry	1	0	1	2
PMT 305	Introduction to Building Construction	1	0	1	2
QST 203	Construction Measurement I	1	0	1	2
Total					19
Communication Technology Projects Option					
EEE 311	Computer Organization & Architecture	1	1	0	2
CIT 303	Systems Analysis & Design	2	1	0	3

IFT 301	Principles of Telecommunication Technology	1	0	1	2
Total					20
Energy Projects Option					
PMT 313	Energy Conversion Technologies	2	0	0	2
PMT 309	Energy Economics	1	1	0	2
EVT 317	Renewable Energy, Resource Conservation & Sustainable Development	2	0	0	2
Total					19

*Construction Projects Option takes ENG 305

*Industrial Projects, Energy Projects Options takes ENG 309

Year Three (300 Level)

Rain Semester

Course Code	Course Title	L	T	P	Unit
ENS 302	Business Creation, Growth & Corporate Governance.	1	0	1	2
LIT 316	Operations Research I	2	1	0	3
CIT 302	Computer Programming II	1	0	1	2
LIT 304	Marketing Management & Practice	2	0	0	2
LIT 306	Management Information System	2	0	0	2
Electives: (Option Area Compulsory)					
Industrial Projects Option					
PMT 302	Fundamentals of Industrial Technology	2	1	0	3
PMT 306	Materials & Inventory Management	1	1	0	2
PMT 308	Materials Handling Systems Design & Analysis	1	1	0	2
Total					18
Construction Projects Option					
PMT 310	Tendering & Estimating	2	0	0	2
CIE 316	Soil Mechanics I	2	0	1	3
STE 326	Structural Analysis I	2	1	0	3
CIE 304	Elements of Architectural & Civil Engineering Drawings	1	0	1	2
Total					21
Communication Technology Projects Option					
IFT304	Computer Graphics	1	0	1	2

COE 318	Principles of Electronic Communication	1	1	1	3
CIT 306	Web Design & Programming I	2	0	1	3
Total					19
Energy Projects Option					
PSE 312	Electrical Power and Machines	2	1	0	3
ENG 304	Heat and Mass Transfer	2	0	1	3
PHY 316	Energy and the Environment	1	1	0	2
Total					19

Year Four (400Level)

Harmattan Semester

Course code	Course title	L	T	P	Unit
LIT 447	Research Methodology	2	0	0	2
LIT 403	Operations Research II	2	1	0	3
LIT 405	Technical Report Writing & Presentation Skills	1	0	1	2
LIT 407	Introduction to Disruptive Technologies	2	0	0	2
PMT 401	Systems Engineering	2	1	0	3
Electives (Option Area Compulsory)					
Industrial Projects Option					
IPE 411	Manufacturing Processes II	2	0	1	3
IPE 403	Work Study & Productivity	2	0	1	3
Total					18
Construction Projects Option					
STE 401	Structural Analysis II	2	1	0	3
PMT 403	Infrastructure Construction Technology I	2	0	0	2
CIE 431	Soil Mechanics II	1	1	1	3
Total					20
Communication Technology Projects Option					
IFT 407	Remote Sensing Technology	2	0	0	2
ECE 409	Multimedia Systems & Technologies	1	1	0	2
IFT 401	Internet of Things	2	0	1	3

Total								19
Energy Projects Option								
EEE 403	Principles of Energy Process	1	1	0	2			
PSE 409	Electrical Power Plant Engineering	1	0	1	2			
PSE 413	Power Systems Engineering Studio I	2	0	1	3			
Total								19

Year Four (400Level)

Rain Semester

Course Code	Course Title	L	T	P	Unit
SIW 400	Industrial Attachment/Internship (Rain Semester)	0	0	4	4
SIW 401	Industrial Attachment/Internship (Long Vacation)	0	0	2	2
Total					6

Year Five (500 Level)

Harmattan Semester

Course Code	Course Title	L	T	P	Unit
LIT 503	Operations Management	2	1	0	3
LIT 501	Human Resources Management	2	0	0	2
LIT 505	Business Ethics & Governance	2	0	0	2
PMT 500A	Research Project I	0	0	3	3
PMT 501	Computer Based Project Management	1	0	1	2
PMT 503	Project Planning & Control	1	1	0	2
Electives (Option Area Compulsory)					
Industrial Projects Option					
PMT 505	Industrial Machinery & Ergonomic Analysis	1	1	0	2
MEE 505	Computer Aided Design & Manufacturing	1	1	1	3
IPE 507	Manufacturing Processes III	1	0	1	2
Total					21
Construction Projects Option					
PMT 507	Infrastructure Construction Technology II	1	1	0	2
PMT 509	Contract Administration	2	0	0	2
STE 403	Reinforced Concrete Design I	2	0	1	3

Total					21
Communication Technology Projects Option					
CSC 511	Artificial Intelligence & Experts Systems	1	0	1	2
COE 513	Data Communication	1	1	0	2
IFT 507	Software Engineering & Practice	1	1	0	2
Total					20
Energy Projects Option					
MEE 407	Combustions and Fuels	1	0	1	2
PSE 503	Power Systems Engineering Studio II	1	1	0	2
PSE 513	Power Systems Planning, Reliability and Economics	2	1	0	3
Total					21

Year Five (500 Level)

Rain Semester

Course Code	Course Title	L	T	P	Unit
PMT 502	Project Design & Environmental Impact Assessment	1	0	1	2
PMT 500 B	Research Project II	0	0	3	3
PMT 504	Project Risk & Safety Management	2	0	0	2
PMT 506	Project Cost Estimation & Tendering	1	1	1	3
PMT 508	Maintenance Management	2	0	0	2
LIT 502	Cost and Management Accounting	2	0	0	2
Electives (Option Area Compulsory)					
Industrial Projects Option					
PMT 510	Production Planning & Control	1	1	1	3
PMT 512	Automated Manufacturing System & Control	1	1	1	3
Total					20
Construction Projects Option					
STE 518	Reinforced Concrete Design II	2	0	1	3
PMT514	Construction Economics & Management	1	0	1	2

PMT 516	Quantification & Costing of Construction Works	2	0	0	2
Total					21
Communication Technology Projects Option					
IFT 508	Systems Implementation & Evaluation	2	0	0	2
IFT 502	Computer Modeling & Simulation	1	0	1	2
COE 506	Communication Network Planning & Management	2	1	0	3
Total					21
Energy Projects Option					
PMT 518	Circular Economy	2	0	0	2
MEE 510	Power Plant Engineering	2	1	0	3
PTL 520	Financial Engineering in the Energy Sector	1	1	0	2
Total					21

NOTE: L = Lecture P = Practical T = Tutorial

COURSE CONTENTS AND DESCRIPTIONS

100 LEVEL HARMATTAN SEMESTER

MTH101: Elementary Mathematics I (3,1,0)

Number systems, Indices, Surds and logarithms. Polynomials, Remainder and factor theorems. Polynomial equations, Rational functions. Partial fractions. Fields ordered fields. Inequalities, Mathematical Induction. Permutations and combinations, Binomial theorem, Sequences and series. The quadratic equation and function. Relation between the roots and the coefficients. Complex numbers. Addition, subtraction, multiplication and division. Argand diagram. De Moivre's theorem, n-th roots of complex numbers. Elementary set theory. Venn diagrams and applications. De Morgan's laws. Trigonometry, Elementary properties of basic trigonometric functions. Additional formulae and basic identities. Sine and cosine formulae. Half angle formulae. Area of a triangle. Solution of trigonometric equations. Inverse trigonometric functions. Function, concept and notation examples. Composition, exponential and logarithmic functions. Graphs and properties. Limits and continuity. Techniques for finding limits. The derivative calculation from first principles. Techniques of differentiation. Chain rule order derivatives. Mean value theorem. Applications. Indeterminate forms and U Hospital's rule. Taylor and Machlaurin's series curve sketching. Integration as reverse of differentiation, as area, as limit of finite sums. Definite integrals. Properties of definite integrals.

PHY101: General Physics I (2,1,0)

Mechanics: Space and time, units and dimension, vectors, Kinematics, Newton's Law, Galilean invariance, static and dynamics of particles, universal gravitation, work and potential energy, conversion of energy and momentum, rigid bodies, fluid mechanics. Thermal physics, thermal properties, including elementary thermodynamics and kinetic theory.

PHY 107: General Physics I Practical (0, 0, 1)

This introductory course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102.

CHM101: General Chemistry I (2,1,0)

Atomic structure and the periodic classification of the elements: ionic and covalent bonding including the effect of dipole-dipole interfacing on physical properties. Redox reactions and the concept of oxidation numbers; introduction of gas kinetics: introduction to nuclear chemistry, Solid and lattices structure; acid-base reactions; general principles of extraction metals.

CHM 107: General Chemistry I Practical (0, 0, 1)

Laboratory experiments designed to reflect the topics taught in CHM 101 and CHM 102 such as qualitative and quantitative chemical analysis, acid-base titrations. Gravimetric analysis. Calculation, data analysis and presentation. Functional group analysis.

BIO101: General Biology 1 (2,0,0)

Science methods and characteristics of living and non-living things. Cell and tissue biology. Elements of biological chemistry cellular metabolism. Taxonomy of living things, hereditary and evolution. Element of ecology and types of habitats.

BIO 107: General Biology 1 Practical (0, 0, 1)

Laboratory experiments designed to illustrate the topics covered in BIO 101.

ENG101: Workshop Practice 1 (0,0,1)

General use of engineering measuring instruments e.g. Calipers, gauges etc. Introduction to hand tools e.g practice in wood planners. Sanders and pattern making; sampling and sizing techniques, raw materials. Sheet-metal work: Production of sheet metal products-layout, cutting and shaping, gas welding, sold - erring, brazing, and fasting assembly. Basic woodworking principles and tools layout methods, cutting and evaluation, finished products.

ENG103: Engineering Drawing 1 (0,0,1)

Introduction to use of drawing/drafting instruments. Descriptive geometry and geometric construction. Drawing, measuring, lettering and dimensioning objects in various positions. Principles of orthographic projections in the first angle.

GST101: The Use Of English 1 (1,1,0)

Library orientation, aids through dictionary practice, vocabulary development techniques, reading and comprehension, listening and note-taking techniques-outline and summarizing, dealing with examination questions.

GST103: Humanities (1,0,0)

Introduction to the humanities definition and rationale. Role of literature in the humanities, aspects of the contemporary African novels, significant examples of African/Western poetry; dramatic art-role and relevance in modern Nigeria with practical demonstration/performance, Role of philosophy in the humanities, man and his quest for certainty, materialism, idealism; the meaning and significance of selected concepts-freedom, responsibility, obligation, the good life, art beauty; values-relative and not relative; inductive arguments and scientific reasoning. Exposure to African History- its role and relevance, African Art and Music - its history and development. Religion and the meaning of life-past, present and future.

IGB101: Introduction to Igbo Grammar, Composition and Comprehension I (1,0,0)

An Introductory study of Igbo, this course teaches the following; Igbo history and origin. Evolution of Igbo written language, Igbo alphabets and word features (for the sake on non-Igbo students). Parts of speech, Igbo phrases and clauses, sentence patterns, elements of simple sentences (subject, verb, compliment and adjunct), Principles of Igbo syllable and structure, vowel harmony, tone and tone drills, translation, composition (types and styles of composition), organization and language use, comprehension, summary skills, exercises, in oral delivery, public speech and address in Igbo, spelling in Igbo.

FRN101: French Language I (1,0,0)

French alphabets, consonants sounds, vowel sounds (i) pure vowels, (ii) nasal vowels, diphthongs, simple sentences, self-introduction, pronunciation, accentuation and intonation (stress pattern) and oral drills.

100 LEVEL RAIN SEMESTER

MTH102: Elementary Mathematics II (3,1,0)

Transcendental functions, Hyperbolic function, Inverse functions, Logarithmic differentiation. Methods of integration. Integration rational functions, Integration by parts, Improper integrals, Applications, Areas and Volumes, Center of mass, Ordinary differential equation, first order linear equation, second order homogenous equations with constant coefficients, Applications. Plane analysis geometry, Rectangular Cartesian coordinates, Distance between two points. The straight line Loci. The circle, parabola, ellipse and hyperbola. Second degree curves. Plane polar coordinates Vectors. Vector functions and their derivative. Velocity and acceleration. Matrix algebra. Addition and multiplication. Transpose. Determinants. Inverse of non-singular matrices. Cramer's rule and application to the solution of linear equations (Examples should be limited to $m \times n$ matrices where $m \geq 3, n \geq 3$). Transformations of the plane. Translation, rotation. Enlargement, shear composition of transformation. Invariant and lines.

PHY102: General Physics II (2,1,0)

Electricity and magnetism, Electro statics: conductors, currents, dielectrics; magnetic fields and induction; Maxwell's equation; electromagnetic oscillations and waves. Geometrical optics; geometrical methods applied to the optics of mirrors, lenses and prisms.

PHY 108: General Physics II Practical (0, 0, 1)

This is a continuation of PHY 107.

CHM102: General Chemistry II (2,1,0)

Physical and chemical equilibrium, elementary electrochemical kinetics; Survey of reactions of functions groups in alphabetical and aromatic compounds. Concept of hybrid bonds. Alkenes, reactions of carbon-carbon multiple bonds; elimination and substitution reaction of alcohol and alkyl halides; addition and elimination reactions in benzene; hydroxyl groups and carbonyl compound, organic acids bases and derivatives.

CHM 108: General Chemistry II Practical**(0, 0, 1)**

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

ENG102: Workshop Practice II**(0,0,1)**

Industrial safety; Behaviour analysis safety consciousness. Survey of sources of common accidents. Accidents prevention and control. Machine-shop work: Lethe-work: Instruction of metal working process. Shaping, milling, grinding, drilling and metal spinning etc. Design of simple jigs and fixtures. Automobile diagnosis and repairs. Electrical Workshop Practice: Convention and application of colours codes and sign etc. Use of the tools, machines and conductors.

ENG104: Engineering Drawing II**(0,0,1)**

Isometric projection. Freehand and guided sketching. Sectioning conventional practice, conic sections and development. Methods of reading and reproducing drawings, graphs and charts. Interpretation of solids.

GST102: The Use Of English II**(1,1,0)**

Second stage library work with emphasis on effective search techniques, paragraph development, essay writing principles and practice, term-paper writing, technical report, business letter writing, grammar and mechanics review, referencing and documentation.

GST108: Social Sciences I**(1,1,0)**

Introduction: The nature and scope of politics and economics. Definition of basic concept in economics and political science. Nigeria's Public Sector. The political setup in Nigeria. The civil service structured Public investment and economic infrastructure. The economic role of government: Government expenditure and revenues, fiscal federalism and revenue allocation, Nigeria's private sector. The financial system in Nigeria. The role of the agricultural sector in the development process. The industrial sector and public investment in Nigeria. Human resources development and utilization in Nigeria, national development planning-problems and prospects, aspects of economic and technological dualism. Political and economic future of Nigeria. A global perspective of economics, economics systems and developing nation's economies. International trade and economic development: Balance of payments commercial policies of Nigeria and other developing countries. Economic integration; state and structure of economics of ECOWAS countries; the EGA and economic cooperation in African. Foreign aid and investments: The International Corporation, technological transfer and technological independence. Global inter-dependence and the New International Economic Order World economic crises -energy and OPEC, food storage and armament.

GST110: Science, Technology And Society**(1,0,0)**

The scientific evolution of man-science and need for science, history of science, classification, modern scientific methods; science and man's environment; terrestrial and cosmic life; harnessing science - climate and vegetation. Production, processing conversion, distribution; energy resources; solar thermal nuclear energy - fossil fuels, estimates of energy reserves in Nigeria. Key revolutions in technology; electronics and computer technology, robotic and cybernetics, everyday application; technology history of technological evolution/practice in Nigeria, role of technology in the national economy. Education for technology - past, present and future; constraints in the utilization of new technological products - reliability quality control, cost effectiveness, politics an environment; effects of mechanization, consumerism; social implications of scientific advances - science in the civilization of man, science and culture; society - social implication of scientific advances e.g. population explosion, environment pollution; social implication of technological research and advances: e.g displacement of man by machines, space travel threat of nuclear and neutron war, genetic research, energy crisis, ethics in technology; ethics, professionalism, legal aspects.

IGB102: Introduction to Igbo Culture II (1,0,0)

This course introduces students to the Igbo as a people, their language, literature and culture. Greetings and respect in Igbo land, Igbo hospitality, (kolanuts and presentation), Igbo institutions: Marriage, family, socio-cultural institutions, economic institutions, religious institutions, health institutions, political institutions, Relationships with neighbors, myths and taboos, life and death, burial rites, Igbo belief systems, scope of Igbo literature, characteristics and general utility of oral and written literature, survey of written works in Igbo language, prose, poetry, drama and excursion.

FRN102: French Language II (1,0,0)

Three broad groups of French verbs (er, ir, re). Articles – uses, regation types, idioms and vocabulary related to: greetings gratitude, joy, sympathy, and regrets, school, home, town and village, wants, needs and satisfaction, time and weather. Expressions for numerals (1-50), nouns-gender, and number, pronouns-personal, visits to and collaboration with alliance francaise, excursion to French village.

200 LEVEL HARMATTAN SEMESTER**MTH201: Mathematical Methods I (2,1,0)**

Functions of two or more variables. Limits and continuity. Partial derivatives, directional derivative, target plane and normal line. Gradient. Chain rule. Total differential, implicit functions. Jacobians. Inverse functions, maxima and minima, Lagrange multipliers. Higher order derivatives. The Laplace. Second derivatives test for maxima and minima. Exact differentials. Derivative of integrals. Taylor's theorem. Multiple integrals. Calculations of areas, volumes, centre of mass moments of inertia and etc. Infinite sequences and series. Tests for convergence. Absolute and conditional convergence. Power series. Pre-requisite: MTH 101 and MTH 102.

STA211: Introduction To Statistics And Probability (2,1,0)

Frequency distribution, measures of location and dispersion in simple and grouped data. Laws of probability. The binomial, Poisson and normal distributions. Estimation and tests of hypothesis. Analysis of variance and covariance, simple regression and correlation, contingency tables 2x2 application. Pre-requisite: MTH 101/MTH 102.

CSC201: Computers and Applications I (2,1,1)

Brief history of computers and computer generation Classifications of computers. Structure of a general purpose computer. Number systems. The stored program Techniques of problem solving. Flowcharting, Stepwise refinement. Algorithm for searching, sorting and merging of ordered lists. Data presentation I/O devices. Data types Data representation. Data capture problem - oriented languages. BASIC and VISUAL BASIC programming arithmetic expression, assignment statement; I/O commands; logical expression; arrays, sequencing alteration and iteration; sub-programmes and parameters Elementary numerical algorithms. Pre-requisite: MTH 101 and MTH 102.

ENG201: Engineering Workshop Practice III (0,0,1)

Foundry and sand testing, mixing of sand preparations of moulds, pattern marking-solid, spilt sweep pattern hoisting gates and risers. Melting and pouring of metals. Detection of defects. Welding: manual and welding-butt, T-joints, edge preparation, surface cladding, argon and welding, Co2MIG welding. Pre-requisite: ENG101 and ENG102.

ENG203 Engineering Drawing III (1,0,0)

Prerequisite: ENG 103, ENG 104

Tolerance: Allowance and clearance between mating parts. Different types of fits. Machining symbols including welding symbols. Detailed assembly drawing of machine components for engineering system models. Preparation of drawing of parts and a given assembly. Preparation of pictorial and exposed views of assembly.

GST201: Social Sciences II (1,0,0)

Concept and meaning of development; traditional African - its geographical and ethnographical review, its family structure, kinship system, etc. Socio-economic pre-occupations, political systems, art and music, modes of communication; Africa and the press, urbanization and social change, modern trends in art and aesthetics, nationalism and cultural revival, mass media and national development.

LIT201: Economics I (Microeconomics) (2,0,0)

Nature of paradigms in the sciences. Abstract models and models and socio-economic change. The nature and method of economic system. Supply demand and elasticity. The cost of production. Price and output determination under pure competition: monopoly, monopolistic competition and oligopoly. Demand for economic resources; wages, rent, interest and profit determination. Unionism. Current economic problem: the social control of industry the farm problem. Rural to urban migration, the economics of income distribution, the economics of war and defense.

ENG207: Introduction to Engineering Materials I (1,1,0)

Prerequisite: CHM102, PHY 102

Atomic structure, molecular structure, classification of engineering materials metals, ceramics, polymers, etc.

Metals: Extraction of metals, iron and steel making, aluminium smelting and extraction and nonferrous metals e.g. tin. Application and limitations of pure metals.

Crystal structures: Lattice unit, Bravais lattice, symmetry, lattice planes and directions, Miller indices, interplanetary spacing, packaging of spheres, simple cubic, body-centred cubic, face-centred cubic and hexagonal packing. Interstitial Sites: Sizes and distribution. Imperfections in crystal, surface and boundary defects, vacancies and interstitial. Dislocation twinning. Phase diagrams and alloy theory, heat treatment of carbon steels. Precipitation hardening. Non-wearable engineering alloys, processing methods.

LIT 203: Introduction to Logistics (2,0,0)

Definition of Logistics; Introduction to key concept of Logistics; The Historical perspective of Logistics; Logistics and supply chain structure; Logistics Role in the Economy /Organization; Logistics and Customer Service; Procurement and outsourcing; Inventory Role & Importance of Inventory; Inventory Management; Materials Management; Transportation; Warehousing / Distribution; Packaging and Materials Handling; Global Logistics; supply chain management and Logistics Strategy; Logistics Information Systems and technology application; Organization for Effective Logistics Performance; Financial issues in Logistics Performance; Integrated Logistics in supply chain; Role of 3PL & 4 PL.

200 LEVEL RAIN SEMESTER

CSC202: Computer and Applications (1,1,1)

Application packages: Word processing, Spreadsheet, Presentation package, Statistical packages. Internet Applications, and Database Management System. Software Tools involved: SPSS, MATLAB, OCTAVE, Oracle, Simulink, AutoCAD, ArchCAD, Latex, etc. Computer problem-solving methods: Role of algorithms in problem-solving; Concepts and properties of algorithms; Implementation strategies;

Development of flowcharts and pseudocodes; Program objects; Implementation of algorithms in a programming language such as Visual Basic, Java, C/C++.

MTH202: Mathematical Methods II (2,1,0)

Vectors, Product of vectors. Equations of lines and planes. Vector spaces. Linear dependence and independence. Basis and dimensions. Linear transformations matrices. Operations in matrices. Rank of a matrix. Determinants, inverse of a matrix. Solutions of systems of linear equations. Cramer's rule. Eigen values and Eigen vectors. Similarly to diagonal matrices. Bilinear and quadratic forms. Applications. Pre-requisites: MTH 101 and MTH 102.

LIT204: Introduction to Finance & Accounting (2,1,0)

Types of Business Enterprise finance, sources and markets; calculation of cost of different types of capital and Weighted cost of capital; setting up accounting system for financial reporting; Bookkeeping, preparation of ledger accounts. Trial balance, profit and loss account. Income and expenditure account and balance sheet. Analysis and interpretation of various financial and accounting costs. Fixed and variable costs, standard cost; techniques for cost estimation and control; Management accounting; Profitability planning and measurement.

LIT 202: Economics II (Macroeconomics) (2,0,0)

National income accounting: various definitions and measurements of income and output. The circular flow in come. The business cycle-unemployment and inflation. The consumption function, saving and investment. Changes in equilibrium level of net-national production and the multiplier. The acceleration principle. Balance of payment, money demand and supply. The banking system - the economics and balance of payment. Introduction to population economic growth and development. The origin of under-development and dependency.

Pre-requisite: LIT 201.

CIT 202: Computer Programming I (1,0,1)

Data types and their use in programming languages. Static & dynamic typing. Data typing in PASCAL, ADA, SIMULA, etc. Translation techniques. Interpretation & Compilation. Control Structures; sequencing, selection & repetition. Sub-program units; blocks, co-routines & concurrent units. Parameter passing techniques. Concept of binding in programming languages: Static & dynamic scope binding. Storage allocation techniques in languages. Functional languages: LISP, APL, etc. Imperative languages: BASIC, PASCAL, ADA, C, C++, Matlab and Python languages, etc.

LIT 206: Introduction to Innovation Technology (2,0,0)

Definition of Applied Technology. Applied Technology and Industry Evolution. Technology's impact on every aspect of the world. Understanding of the operating principles and industrial practices of related technologies. Digital tools/technologies and products/systems designed to help people solve problems, create, communicate, and/or increase efficiency. The characteristics and scope of technology. The core concepts of technology. The relationships among technologies and the connections between technology and other fields of study. The cultural, social, economic and political effects of technology. The effects of technology on the environment. The role of society in the development and use of technology.

Definitions of innovation. Creativity and innovation. Dynamics of technological innovation. Industrial implications of technological innovation. Innovative uses of technologies. Innovation adoption, diffusion, market growth, new product entry and competitor responses. Managing the innovative performance of technical professionals. Intellectual property and innovation. The financing of innovation. The contribution of public entities to innovation and technological change. The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving. Individual collaborations, strategic alliances and innovation: insights from the industry.

PMT 202: Introduction to Project Management & Technology (2,0,0)

The history of Project Management as a profession and the different professional bodies. The nature of Project Management; characteristics of a project. The functions of the Project Manager. The Project Manager and National Development. Project Management processes and organizational structure- the functional, project oriented and matrix (type A, B and C). The project life cycle. The project concept and project idea formulation. Environmental issues in project management, environmental impact analysis, risk analysis, economic, technical and financial analysis. Feasibility analysis. The scope of project evaluation.

Project scheduling- Brief Introduction of project planning and scheduling tools- The bar/Gantt chart, the network analysis technique, project time determination, work breakdown structure (WBS), scope determination, WBS dictionary, WBS formats, network and critical path determination, integration of WBS into the network, forward and backward passes, floats and critical paths, resources assignments, deliverables and milestones, monitoring of executions, effective use of Gantt and Bar charts, Line of Balance (LOB) etc. Project management concepts, Planning & scheduling using arrow and activity-on-nodes diagrams, Planning with PERT, Precedence diagrams, Time cost trade-off, Resource allocation and levelling, Project cost control, Engineering contracts, Management and organization of engineering projects, Regulations and licensing for industry, Hands on practice on a software package like MS Project etc.

Feasibility and Viability analysis: The pre-feasibility study, the market component and economic feasibility study using marginal costing approach, the technical component, the site component. Project financial appraisal using the Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index or Excess Present Value Index (EPVI) and cost/benefit analysis.

Contract Management: Project as a contract. Types of Project contracts- fixed price contract, cost plus or cost reimbursement contract and guaranteed maximum price, etc. Tendering and tendering procedures- the open tendering, selective tendering and negotiated tendering. Contract strategies- Design-Build, Prime specialty contract, etc and project surveillance e.g. Project Performance Audit (PPA), Project Management Oversight (PMO). Study of projects, critical path analysis, types of bids, contract documents for various branches of engineering, drawings, Bills of Engineering Measurement and Evaluation (BEME).

Baseline Studies and Environmental, Social, Health Impact Assessment (ESHIA)- Scoping, its importance and relevance. Baseline conditions- Biophysical, Social Impact and Health, etc.

Sources of Project Financing: The sources and cost of capital, Dividend policy and internal financing, delayed payment (e.g. Tax). Managing short term finance, raising long term funds- venture capital.

BLD 206: Building Workshop Practice (1,0,0)

Block laying and concreting tools and equipment; their uses and maintenance; relevant factory acts; safety regulations; concrete materials; block and bricklaying; concreting; classes of timber and uses; wood joints; woodwork machines; painting and decoration; plumbing tools and equipment; electrical wiring and other systems for domestic usage; proprietary products.

ENG 226: Introduction to Electrical & Electronic Engineering (2,0,1)

Review of elector statistics and electromagnetism. Transient and steady-state analysis of circuits, network theorems and techniques, passive and active circuits and building blocks, sinusoidal analysis and phases, transformers, principles and operations of electrical machines, motors, generators, single and poly-phase systems. Introduction to electronic circuits and models, conduction mechanisms and applications of diodes, junction transistors and amplifiers. Introduction to integrated laboratory circuit technology and digital circuits. Laboratory: Analog and digital instrumentation and systems. Applications of operational amplifiers, associated laboratory experiments. Prerequisite: MTH 102 & PHY 102.

ENG 208: Introduction to Engineering Materials II (1,0,1)

Mechanical Properties of materials: plastic deformation of a single crystal, strain hardening, stress-strain curves. Creep, toughness and resilience hardness. Principles of mechanical testing, impact, tensile, hardness, fatigue, creep and non-destructive tests, mechanism of fracture ductile, brittle transition, fatigue, electrical, optical and magnetic properties of metal. Conductors and carriers, conductivity in metals, semi-conductors and insulators, Hall Effect, magnetic circuit and magnetic properties. Emission, absorption, reflection, transmission and refraction. Non-metallic materials: ceramics-structure, properties, processing and applications. Plastic related products, dispersion strengthened composite, fiber-reinforced composites. Wood-softwood, hardwood, structures. Nigerian timbers-strength, properties and tests. Environmental stability of material; corrosion-types of corrosion and corrosion control. Thermal degradation of polymers, dissolution and swelling, radiation damage.

Laboratory: Loading modes in tension compression, torsion and bending. Hardness measurement, stress-strain curves. Ductile and brittle behavior. Communication, sizing and compaction of powders.

300 LEVEL HARMATTAN SEMESTER**ENS 301: Introduction to Entrepreneurship and Innovation (2,0,0)**

This course is an introductory course for studying Entrepreneurship for the first time. The design and flow of the course are aimed at creating awareness and providing the knowledge and skills that are important in achieving success in human endeavors as a value addition to the student's chosen field of specialization. The course outline is made up of the following topics: Development of Entrepreneurship/ Intrapreneurship, Creativity and intellectual rights, Innovation theories and management, Women entrepreneurship, Business opportunity set and evaluation, Introduction to business strategy, and Introduction to business ethics and corporate governance.

LIT 301: Introduction to Business law & Contract (2,0,0)

The meaning, purpose and scope of law; The Nigerian legal system: - sources of Nigerian law and the court system in Nigeria; Law of contract: -meaning of contract, essential elements of a contract and classification of contracts; Offer, acceptance and intention to contract; Consideration: -meaning and rules; Contractual capacity and reality of contract; Terms of contract; Privity of contract: -meaning and exceptions; Discharge of contract and remedies for breach; Commercial arbitration law; Law of agency; Law of sales of goods; Law of hire-purchase; Law of partnership; Law of negotiable instruments: -Bills of exchange, Cheques, Promissory notes; Insurance law; Business torts.

LIT 303: Engineering Economy (2,0,0)

Engineering Economy Engineering Costs & Estimating; Estimating Models & Cash Flow; Time value of money, equivalence, compound interest; Uniform series & compound interest factor; Arithmetic & geometric gradient; Nominal & effective, continuous compounding, Economic criteria, PW technique; Economic analysis problems; Annual cash flow analysis; Analysis period Rate of return; Rate of return analysis; Choosing the best alternative; Incremental Analysis; Future worth analysis & B/C Ratio; Payback period; Sensitivity & breakeven analysis; Depreciation, Unit of Production; Depreciation, Depletion; Income Taxes; After tax RoR; Replacement analysis; Inflation & price change; MARR; Estimation of future events, Risk & Exp; Value Money & Markets

PMT 301: Quality Management & Reliability (1,1,0)

1. Quality concepts: Quality concepts and stakeholder concerns for projects; Evolution of modern concept of Quality management process approach; Quality assurance & control; Quality management system and ISO 9000 : 2000 requirements; Quality system standards for; Inspections & tests; Quality management tools; Environmental Management System Standards and

their application in project management; EMS - QMS relationships; Acceptance sampling; the design of single acceptance, sampling plans; Double and multiple sampling.

Control charts; Types of control charts; the use of the "Average outgoing quality limit" (AOQL) of a single sampling table, the use of the 'lot tolerance percent defective' (LTPD)

Concept and philosophy of TQM; Quality circle, Quality cost; Practical aspects of quality control of projects. Good practices and managerial responsibilities.

2. Introduction to concept of quality in project design, construction, and industrial processes; standard definition of quality; Deming's principles; Concepts by Juran, Ishikawa, Crosby, Taguchi etc.; Special features of construction vs. Manufacturing sectors; Organisation for quality management; Quality of projects and stakeholders concerns, quality responsibilities and commitment of architect, consultant, project managers, engineers and contractors.

3. Tools and Techniques: Seven tools of Quality control, Eight Quality Management principles, SWOT analysis, Ishikawa Diagram, Pareto Analysis, Statistical Quality Control, Brainstorming, Delphi Technique; PDCA cycle, Quality circle, Bench marking, Quality Cost and Quality function deployment (QFD), Just in Time technique, Quality control of materials, Good construction practices, Legal requirements: inspection and reporting, Training and skilled workforce.

4. Management systems for TQM: Quality systems concepts for project design, construction and management activities; Quality systems standards of BS 5750/ QS 9000 series and their evolution. Quality Management System ISO:9001:2007, Environment Management System, ISO:14001:2004, Occupational Health and Safety Management System-ISO:18001:2007. Aspect Impact analysis, Hazard identification, Risk evaluation, and Risk Control in project based environment.

LIT 305: Industrial Psychology and Ergonomics (1,1,0)

Nature and Scope of Industrial Psychology. **Personality and values:** The five personality models: stages of personality development and trait; Personality determinants. The importance of values and types and types of values. **Perception:** Nature of Perception and its importance. Factors that influence perception: Attribution theory: perceptual organization: social perception. **Attitudes and job satisfaction:** main compounds of attitudes and major job attitudes: measuring satisfaction and causes of job satisfaction. The impact of satisfied and dissatisfied employees on the work place. **Emotions and moods:** The positive and negative function of emotions and sources of emotions and moods: Emotional intelligence. **Motivation:** concepts and applications; motivation by job design: (job characteristics model). Employee involvement: using rewards to motivate employee involvement: using rewards to motivate employees. **Learning Process:** Learning theory; Principles of learning: Techniques of administering reinforcement: The effect of punishment. **Group dynamics:** nature of group: stages of group development: group properties: norms, roles, status, size, cohesiveness and diversity: Group decision making. **Leadership theories:** trait theories, group theories contingency and path goal theories. Case studies. Principles of ergonomics, Basic cognitive, Capabilities and limitations of the workers, environmental situation and limitations conducting an ergonomic assessment, Developing an ergonomic program, Ergonomic issues related to posture, materials Handling/Lifting, Frequent types of injuries related to workplace design, Repetitive motion, and cumulative trauma disorders, Preventing ergonomically related injuries by redesigning the workplace, Designing displays for Workers, Transfer and design of information, Controls and control arrangements, Keyboards and input devices for computers, Occupational and human stress.

PMT 303: Facility Design & Sustainability (2,0,0)

Facility management defined; scope, reality and perception. Standards. Concepts and importance of maintenance: Definitions, Causes of defects/failures/malfunctions in built environment and machines, maintenance needs, resources for maintenance, maintenance manuals/equipment, etc. Types/Nature of Maintenance: Maintenance Systems-planned, unplanned, adhoc, etc.

Alterations and Improvements, Maintenance Economics: specifications, measurements, measurement and pricing of maintenance work, cost-in-use, life-cycle cost.

Planning and financing of Maintenance Work: Maintenance management-contract and direct labour, organization, maintenance contracts and agreements, work orders and work requests; quantitative technique in maintenance management. Repairs: Repairs, Replacement policies.

PMT 307: Product Design & Development (1,1,0)

Generation of ideas for product development, creativity and innovations, industrial and manufacturing research. Product life cycle, product policy of organizations. Factors influencing product design. Product analysis e.g. marketing, functional, operational, aesthetic, economic and production aspects of product design. Bill of materials, product tree structure, work breakdown structure. Product development cycle and stages. Economic and strategic advantages of product development. Assembling drawings and charts. Process flow chart. Prototyping, modularity and upgradeability of products. Quality function deployment, value analysis and value engineering. Time to market, Kano's model. Components and subsystems integration to operations. Process and method study. Process improvement. Design trade-off analysis.

ENG315: Principles of Engineering Survey & Photogrammetry (1,0,1)

Introduction to branches of surveying, principles of survey practice, survey methods. Uses of basic surveying instruments e.g. Theodolite and Levels. Lens. Measurement of distances, angles. Compass and Plane Table. Bearings, theodolite traversing and computation. Adjustment of traverse leveling with dumpy, tilting and automatic levels. Traverse computation. Area computation. Subsistence bar, Tacheometric survey. Topographic surveying. Introduction to national grids.

Laboratory: Adjustment of theodolite and levels. Traversing, Leveling, computation and plotting. Service load conditioned; Shear strength, including cracking and shear reinforcement; Bonding, Stress and development of reinforcement. Design of one-way slabs. T-sections in bending, continuous slab-beam-girder and concrete joist floor system; monolithic beam-to-column joints; Retaining walls; members in compression.

PMT 305: Introduction to Building Construction (1, 0, 1)

Site operations, general introduction to basic building, construction, operations and techniques. Basic materials and components-regional variations. Elements of building-foundation, floors, walls, roofs. Detailing of elements of building of all types-residential, industrial, commercial etc. sub-soils and conditions. Non-load bearing and load bearing walls. Types of floors and roofs. Drainage, external works and landscaping. Detailed study of materials and their performance in construction. Processing of building materials, current bye laws, specifications. Construction tools and equipment, soil explanation.

QST 203- Construction Measurement I (1,0,1)

Historical background of Quantity Surveying; origin of Quantity Surveying in Nigeria. Functions of professional Quantity Surveyor; functions of the contractor's quantity surveyor; history and objectives of the Nigerian Institute of Quantity Surveyors; the history and objectives of quantity surveyors registration board of Nigeria, etc. the course is also an introduction into the mechanics of measuring building works. Functions of bills of quantities. Principles of mensuration, taking off, abstracting and billing. It is equally an introductory aspect of estimating and costing methods.

EEE 311: Computer Organization & Architecture (1,1,0)

Review of the evolution of computers. The organization of a simple digital computer: stored programme concept, data representation; instruction format; addressing modes; instruction sets; arithmetic operations, parallel processing. Memory Unit: random access, memory hierarchy and methods of direct access. Central Processing Unit: Control Unit and Arithmetic and Logic Unit; microprocessors and Controllers. The Control Unit: hardwired control and micro-programmed control. The Arithmetic Unit.I/O devices and

their characteristics. The Input and Output Unit: I/O buses/ports: PCI, EISA, USB, I/O interfaces; and standards.

CIT 303: System Analysis and Design (2,1,0)

System concepts; System components, Introduction to SSAD. System development life cycle: Project planning, Requirements specifications, Analysis, Preliminary investigation: Fact gathering & techniques. Data delivery, Data flow diagrams. Process description; System design: Automated design tools, Data modelling, Structure charts, I/O and Report forms designs, security; Data Dictionary, Software design & coding System implementation: Software development; Hardware acquisition, System integration and testing; Cost and time estimation and management of system development, System maintenance; Case studies and projects.

IFT 301: Principles of Telecommunication Technology (1,0,1)

This course is made to provide basic knowledge in wired and wireless information system (WIS) and its technology. These include wave propagation, antenna systems, mobile communication, and design and planning of communication networks. The breakdown include, definition of telecommunication, history of wired and wireless communication, telecommunication media, electrical, microwave radio, light photonic, twisted pair, coaxial cable, Fibre optic cable, Hybrid fibre coaxial (HFC) Cellular Radio, Personal communication, Radio and pot Infrared, telephony, technology of voice communication, telephone channel capacity, central office switch and instrumentation, Data communication, Telegraphs, Radio Telegraphs, Telephone System, data signal, Data links, Asynchronous and Synchronous communications, Error Dictation, Error Correction, data capabilities, ISDN, PBX, Automated Teller Machine (ATM), Telecomputing, EDI. Satellite orbits areas, Primary advantage of Broadcasting, Cable Television, Voice communication, Direct Broadcasting Satellite, Mobile Satellite communication, Telephony, Navigation and Global positioning system (GPRSO). Environment of space and satellite location and orbit position. Antenna subsystem, Transponder subsystem, Beam shaping, Power supply, Command and telemetry, Track and data relay systems, Earth stations technology, Parabolic Dish (Antenna), Feed horns and low noise amplifier, Earth station receivers (Turners), Link attenuation factors frequency band tradeoffs, Digital Video Compression, Encryption Methods and Techniques, Satellite Lunch providers, Satellite Common Carriers, Selling the space segment.

300 LEVEL RAIN SEMESTER

ENS 302: Business Creation, Growth and Corporate Governance (2,0,0)

The aim of this course is to develop student's competence and confidence in creation viable businesses with high potentials for new value addition and commensurate actions. The course is designed to enable students achieve economic independence after graduation. Its main objectives are to help change student's mind-set towards paid jobs and over-dependence on families and government. By the end of the course, students will have the capacity to identify opportunity sets or need-gaps in the society, take advantage of such gaps and midwife them to success. They will also be able to grow ventures capable of generating employment, create wealth and efficiently allocate and utilize productive resources.

LIT 316: Operations Research I (2,1,0)

History of operations research. Phases of an operations research project. Operations research and its systems orientation. Characteristics of operations research, operations research models. Fundamentals of linear programming, matrix application in optimization. Linear programming model (graphical). Sensitivity analysis. Applications. Some variants of linear programming; Transportation model and the assignment model. Critical Path Method (CPM) and project evaluation review technique (PERT). Inventory control model (Deterministic case only), input-output analysis and factor analysis. Integrity;

disaster planning; backup procedures and recovery; confidentiality and legal responsibilities; data protection legislation. MIS development.

CIT 302: Computer Programming II (1,0,1)

Review of data types, data structures. Use of modern programming tools in implementing business problems. Programming languages; object oriented programming, C++, JAVA, HTML and XML, and commonly used software packages, Oracle suites, ASP. Net, IIS and Apache.

LIT304: Marketing Management & Practice (2,0,0)

The role of marketing in today's organizations. Tasks and philosophies of marketing management. Marketing system. Marketing channels. The marketing mix, Marketing research, tools and process. Product life cycle, New product development, Promotion, Pricing and distribution strategies. Marketing communications, physical distribution network decisions, product and branding strategies decisions, pricing policies, strategies and decisions. Product launch and market penetration and sustainability strategies, Advertising, Sales promotion, public relations. Electronic/Digital Marketing.

CIE 304: Elements of Architectural and Civil Engineering Drawing (1,0,1)

Introduction: General description of drawings related to civil engineering projects. Drawings of different stages of projects. General nature specific drawings such as architectural, structural, plumbing, electrical, airconditioning, road and earthworks.

Architectural: Elements of architectural planning and design. Schematic working drawings and details of residential, commercial windows and staircases.

Structural: Elements of structural drawings and detailing; preparation of foundation plan, structural framing, slab and beam/column elevations for reinforced concrete structures. Details of steel joints and fabrication drawings.

AutoCAD: General and basic know how related to computer aided drafting e.g. coordinate systems, drawing setup procedure, basic drawing command etc. 2D drafting, 3D design and civil CAD drawings.

PMT 302: Fundamentals of Industrial Technology (1,1,0)

Method study and Process Design, Production System. CAD/CAM, CAPP and CIMS. Manufacturing process optimization, Agile manufacturing process. Manufacturing machines and equipment. Categorization of processes at basic level: conversion, fabrication, assembly, analytical, synthetic, conditioning and extractive: Metal and non-metal working processes. Casting and moulding, shearing and forming, machining, fabrication and welding/joining, 3-dimensional (3D) printing technology, imaging and coating, additive manufacturing, metal construction. Non metal working processes e.g in chemicals, food, mining, textiles and lumbering. CNC manufacturing, Nanotechnology, revised engineering and flexible manufacturing. Human effects on manufacturing process choice. Industrial business system design and analysis. Organizational behavior in industry. Technology-based and process-based productivity, improvement techniques.

PMT 306: Materials & Inventory Management (1,1,0)

Materials purchase management; Organisation of materials purchasing department; purchase procedures and records; purchase price. Material control; ABC analysis. Determination of stock levels reorder quantity. Stores organization, types of organization, centralized stores, impress stores and Decentralized stores; stores location and layout; classification and coding of materials. Stores routine records. Materials acquisition control,. Receipts and issue of materials. Stores materials control records. Perpetual inventory control system. Method of valuing materials issue. Material ledger, Methods of pricing materials issue, treatment of loss of materials in stores. Materials handling.

Inventory Classifications. Reason for Holding Inventory. The Objectives of Stock Control. The Economics of Stock Control. Approaches to Stock Control. The Action Level Method. Inventory (Stock) Control Models. Problem Associated with EOQ Based System. Introduction to inventory management

and simple inventory models. Inventory models with varying market conditions (such as, discounts, risk factors etc.) Inventory classification and inventory control systems.

PMT 308: Materials Handling System and Analysis (1,1,0)

Concept of materials handling system (MHS). Design and analysis. Industrial processes and MHS. Objectives and elements of MH. MH activities and functions. Relationship between plant layout and functions. Relationship between plant layout and MH. Principles of MH. Trouble shooting and symptoms of bad MH. MH equipment and selection criteria. Unit load concept in MH. Systematic handling analysis. Economics of MH. MH cost and optimization approach. Design consideration in MH. Steps of MHS design. Factors influencing MHS design. Automated and integrated MHS. Simulation-based analysis and design of MHS.

PMT 310: Tendering and Estimating (2, 0, 0)

Contractor procedure prior to tender submission; introduction to principal elements of construction contracts; types of contracts requiring tenders; tender documents and their relevance in estimating; tendering procedures, Factors affecting cost; cost parameters and sources of cost information. Constituents of a rate; the all-in rates for labour and plant; all-in rate analysis and synthesis. Build-up rates for items of excavation & earthworks.

Analysis and synthesis of all-in rates for estimating cost of building work in the following areas; concrete work; brick and block works; roofing; metal work, finishes(wall, floor & ceiling), painting & decoration, glazing, drainage, rubble walling and cladding; underpinning.

Analysis and synthesis of rates in the following areas; plumbing installation-sanitary appliances fitting, pipe work and associated builders' works; electrical and mechanical services; Pricing of items in the preliminary section of bill of quantities. Pro-rata rates. Estimating for civil engineering works.

IFT 304: Computer Graphics (1,0,1)

Introduction to computer graphics concepts, Light and the human visual system; Image manipulations and Raster graphics; Images, quantization and sampling; Characteristics of graphics I/O devices; 2D/3D coordinate systems, transformation, and viewing including scaling, translation, and rotation; Objects Modeling and Visible Surface Detection; graphics pipeline; data structures for graphics; geometry representation; OpenGL programming technique; vertex processing; lighting and shading; rasterization including line and polygon drawing; ray casting; ray tracing; computer graphics in games; visualization; Graphics Lighting and shadows; Transparency and blending; Texture mapping and Local shading models; Environment mapping techniques; Multi-pass rendering; Image Animation and particles; Scene graphs and implementation efficiency.

COE 318: Principles of Electronic Communications (1,1,1)

General definitions and units: Principles and history of communications; International Regulations on frequency allocations and bands used in various applications in electronic communications.

Modulation Techniques in Communication: AM, FM, PM and Keying Techniques, OOK, PSK and ASK. Principles of AM, FM, PM spectral analysis and bandwidths. Modulators and detectors/discriminators for AM and FM signals. Digital and Pulse modulation techniques PAM, PDM, PWM and PCM. Radiowave propagations: Ground wave, troposphere and ionospheres wave propagation, line of sight (LO-S) propagation. Estimation of field strength.

Antennas: Isotropic antenna and elementary dipole. Near and far fields. Antenna parameters and directional properties. Half wave antennas, standing wave and traveling wave antennas. Practical antennas loop, horn, parabolic etc. Antenna arrays broadside, endfire, yagi, HF, VHF and SHF antennas.

CIT 306: Web Design and Programming I (2,0,1)

An introduction to the Internet, the world wide web, and web development. Students will create interactive web pages by writing HTML and CSS and by programming in JavaScript. Topics include

algorithms of web browsers and web servers, interacting with web applications through forms, and using style sheets to separate document structure and document formatting; introduction to digital media.

LIT 306: Management Information Systems (2,0,0)

Concept of Management, Evolution and Functions. Management as a system of systems; Importance of Information in management; Hierarchical multi-level structures of managerial decision making; MIS and evolution, nature of information flows in a management system: bidirectional information flows, computerized information systems, multi-criteria decision making. Decision Support Systems, Information Super High Way across organizations and continents. Designing, analysing, and implementing Information Systems; Building and maintaining Information Systems on the Web for Organizations and for Management. Information theory: System theory - application of entropy, requisite variety, information economics; cost and value, integrity, consumption and usage, redundancy and requisite variety, attributes of data and information, data and files structures.

400 LEVEL HARMATTAN SEMESTER

LIT 447: Research Methodology (2,0,0)

Definition of research, Nature of research & types, characteristics, qualities of researchable topics, Conceptualizing research problems, aim & objectives of a reach, Formulation research questions and hypotheses, scope and limitations of a research. Importance of literature review, Literature sources, Obtaining & evaluating relevant literature, literature search engines, organization of thoughts and arguments, avoiding plagiarism, keeping notes of referred materials. Research philosophies, approaches, process, constructions and designs. Study population, sample size determination, Sampling methods; Variables and measurements, Types of data, collecting secondary data, collecting primary data, Questionnaire design & administration, conducting interviews, Validity & Reliability, data presentation and analysis tools and techniques. Summarizing collected data, Descriptive and Inferential analysis for quantitative and qualitative data, answering research questions and testing hypothesis. Discussion of Results, Summarizing finding, Conclusion & Recommendations. Documentations styles (Harvard and APA), Word processing, editing, organization and formatting. Critical skills required for effective research (critical reading, critical thinking, critical writing and presentation skills).

LIT 403: Operations Research II (2,1,0)

Simplex method of linear programming. Principles of the Simplex method, Duality theory and its applications. Nonlinear programming. Language multipliers and quality constrained problems. Kuhn-Tucker conditions. Applications. Decision- networks applications to investment planning, work force planning, replacement problems, etc. introduction to waiting line (queuing models). Arrival time distributions, service time distributions, the basic waiting line model. Multiple channel model. Applications. Marker chains. Marker systems, n-step transition probabilities, classification of finite marker chains. Some applications.

LIT 405: Technical Report Writing & Presentation Skills (1,0,1)

This course introduces students to the discipline of technical communication. Preparation of technical reports and visuals to supplement text. Workplace and business communications, descriptions and explanations of mechanisms, processes and procedures. Definition, Features, Strategies and types of technical reports: Definition of a technical report; Principles and Strategies of technical report writing; Strategies of technical report writing: Knowing your audience, purpose and length and choice of communication channels and medium; Types of technical reports (memos, minutes of meeting, committee/panel reports. field/survey reports, memoranda, business proposals, consultancy (inception, interim, progress, draft and final) reports. Idea organization and formatting technical reports: Writing

styles & techniques; The 12 golden rules of technical writing; Reading critically; How to start editing; Writing Critically: Critical thinking; Developing synopsis; Identifying major ideas and logical sequence of presentation; Writing clear sentences; Remove Jargon, redundancy & wordiness; Proper editing of reports **Presentation Skills:** Graphic and PowerPoint slides preparation; Peaching; Public speaking

LIT 407: Introduction to Disruptive Technologies (2,0,0)

History and principles of disruptive technologies and innovation. Incremental and revolutionary innovations, and their differences. Technologies behind Incremental and revolutionary innovations and their implications for business models and the geometry of markets. The technical perspective of disruptive technologies like the Internet, online social networks, content distribution networks, virtualization, mobile payments, cloud computing, mobile platforms, data analytics (big data, data mining), the Internet of Things, Internet of Everything, artificial intelligence technology (machine learning, deep learning & information filtering) blockchain technology, unmanned aerial vehicle (drones), robotics and building information model. Application areas of these disruptive technologies in various fields and their possible impacts (Social impacts). This will be supplemented by case studies looking at specific real world examples. Application of fundamental concepts of economics and management to technology-enabled markets, such as the theory of disruptive innovation, network externalities, two-sided markets, multi-sided platforms, single-homing v/s multi-homing, first mover advantage, platform-envelopment, switching cost and pricing models for disruptive innovations. Disruptive technologies anticipation both from technical and managerial perspectives, and frameworks and tools to characterize, leverage and manage these technologies in the work place. The course will also include a number of invited lectures by prominent speakers from the industry and academia.

PMT 401: Systems Engineering (2,1,0)

Introduction: the importance of systems engineering Terminologies. Systems engineering and systems life cycle. The linear and V-forms of the system life cycle. Project management versus systems engineering. The user requirements versus attributes for user requirements. The systems requirement process. The Architectural Design. The Role of models and prototypes in project management. Development environment versus operational environment. Systems engineering versus time to market the right product. Differences between systems and software. The software Engineering process. Quality, schedule and cost versus deliverables. Laplace transformation. Block Diagrams versus open/closed loop systems. Matlab, programs. Industrial controllers.

IPE 403-Work Study and Productivity (1, 1, 1)

(Pre-requisite: ENG206 – Workshop Practice IV)

Procedure – Systematic approach; Therblings and other symbols used in method study, method charts. Ergonomics and Principles of Motion. Economy, Micromotion analysis and photographic techniques. Case studies. Work measurement: Time study using the stop watch procedure. Method rating. Relaxation and contingency allowances. Activity Sampling: Procedure for activity sampling and analysis of data, production study, Predetermine motion time study (P.M.T.S), Principles of method time measurement (MTM), application of MTM. Productivity: Types of productivity. Productivity in manufacturing organization, Factors affecting productivity, Techniques of improving productivity. Job evaluation and wages. Projects: Developing the best method of doing job. Recording techniques. Design of work place layout using principles of motion economy.

PMT 403: Infrastructure Construction Technology I (2,0,0)

Constructional technique for elementary buildings; components of small scale buildings; excavation and earthworks generally; simple foundations. Walls; load bearing and non-load bearing bricks and blocks; bonding and pointing patterns for walls. Floors. Simple roof construction; materials for roof construction; timber, concrete etc.

Roof structure, functional requirement, pitched and flat roofs in timber and concrete, roof covering materials (bitumen, asphalt, light weight roof coverings such as corrugated metal sections). Methods of fixing flat and pitched roofs; roof lights and roof glazing considerations and practice. roof drainage.

External & internal doors and windows' performance standard, types with details - Simple & advanced doors and window; industrial sliding doors and windows, sliding-folding doors and windows, roller shutter doors and revolving doors; furniture and fittings.

Construction Equipment; The selection of the appropriate type and size of construction equipment; The major types of equipment most commonly used in construction; Excavation and Loading Equipment; machines in the crane-shovel family; Compaction and Grading Equipment; major types of compaction equipment; types of grading equipment like motor graders and grade trimmers. Drilling and Blasting Equipment; Major types of drilling equipment like percussion drills, rotary drills, and rotary-percussion drills. Blasting using explosives and dynamites. Lifting and Erecting Equipment in industrial or building construction; such as derricks and tower cranes.

IFT 407- Remote Sensing Technology (2,0,0)

Brief history of remote sensing technology, remote sensing overview, satellite technology and its application to remote sensing. Introduction to RADAR, RADAR equation, tracking, signal management, non-photographic sensor systems, application of RADAR to remote sensing. LIDAR and its application to remote sensing, types of remote sensing data. Applications of Remote Sensing Technology to the following: agriculture, war, image processing and interpretation, mapping, geography, and GIS etc., case studies.

ECE 409: Multimedia Systems and Technologies (2,0,0)

Human-Computer Interaction (HCI): Interfaces and interaction paradigms; Definition of Multimedia and justification for Multimedia. Multimedia types: Hypertext/Hypermedia (HTML, Dexter Model), Networked Multimedia (MM-mail, Internet/WWW, Search Engines). Distributed Multimedia (Virtual Communities, MM Conferencing, and Distance Education). SGML, HTML, XML, CSS, JavaScript Technologies and Interfaces: Media Technologies (Text, Graphics, Images, Animation, Video, Audio); Interaction Style and Modalities (Sight, Sound, Touch); Multimodal Transput (I/O) Technologies (Haptic, Audio, Visual, Motion). Windowing and User Interfaces: Graphical (GUIs) and MM (MUIs).

Multimedia Issues and Systems: Bandwidth Requirements, MM Compression Techniques (Coding Techniques, JPEG, MPEG-1/2/4/7, H.263); The Internet and Multimedia Applications; Quality, of Service (QoS); Multimedia Models and Representation. Multimedia Conferencing and Tools: MM Conferencing Technologies (Meeting Room, Rollabout, Desktop); Audio/Video Tools (NetMeeting, CU-SeeMe); Whiteboard and Data/Application Sharing (Chat, WB, T.120); MM Conferencing Management and Floor Control (Meeting Point). A survey of the theories, elements, and hardware/software components of multimedia.

Exercises: Digital image editing, digital sound and video editing, animation, web page development, and interactive presentations. Emphasis on conceptualizing and producing effective multimedia \ presentations.

IFT 401: Internet of Things (2,0,1)

Introduction to IoT: Evolution, concept, components, standards; Overview of IoT open source hardware: Arduino, Raspberry Pi, Beaglebone, intel galileo; IoT structures and communication protocols, Advance technologies and concepts building up the IoT: IPv6, sensor networks, cloud computing, machine to machine communications, IoT Gateway, Complex Event Processing (CEP), IoT Project Management; Setting up, creating and implementing a live IoT connected solution with Raspberry Pi; Utilizing IoT data: collecting and storage of IoT sensor data, data aggregation, processing IoT data, privacy and security, analysis and visualization of data, cloud computing and IoT, big data and IoT, SDN and IoT; Fog Computing, Application layer protocols for IoT: HTTP, MQTT, Quality of Service, Retain Flag, CoAP, XMPP, AMQP; Real-time networking: soft and real time, quality of service/information, resource

reservation and scheduling, and performance measurements; IoT applications, potential & challenges, and architecture, analytics.

500 LEVEL HARMATTAN SEMESTER

LIT 503: Operations Management (2, 1, 0)

Production and operations management-concepts, functions and ethics. Operations strategy and competitiveness. Facility layout and production system, production planning and control, design of production processes, line balancing. Economic production quantity model. Production engineering, demand forecasting. Capacity planning. Aggregate planning. Master production schedule. Operations priority and job sequencing. Modern forms of production systems, Group Technology Systems (choosing component families, benefits of group technology, material Requirement Planning (MRPI) and Manufacturing Resources Planning (MRPSS), just-in-Time (JIT) manufacture. Introduction and its philosophy, Enterprise Resources Planning (ERP). Its philosophy and applications. Production scheduling with PERT and CPM. Supply Chain Management (SCM): An overview of supply chain management strategy; trends in supply chain management; supply chain networks and factors affecting them. Strategies and methods for aggregate planning. General scheduling problem and factors affecting scheduling. Flow shop job shop scheduling. Sequencing and line balancing using different methodologies. Introduction to forecasting, demand patterns. Factors affecting demand. Time series forecasting methods. System approach, factors affecting demand. Time series forecasting methods. System approach to PPC. Types of manufacturing systems, factors affecting manufacturing systems. Introduction to product design and development process. Inventory management. Productivity. Computer methods in design, Computer geometric modeling, Transformations, Project, Agile/Lean manufacturing. CAD/CAM databases, Introduction to automated machine tools and cutting tools. Numerical control, motion control, APT programming language, CNC machine tools programming, Robotics, Configuration and motions. Introduction to Computer Integrated Manufacturing, Design and analysis of CIM System, small & medium enterprises (SMEs), Justification criteria for the implementation of CIM in SMEs, Strategic alliance and top management support, Business structure, Structural characteristics. System integration. Cost effective engineering solutions using pneumatic and hydraulic power for automation needs.

LIT 501: Human Resources Management (2, 0, 0)

The concept of Human resource management, Human resource management processes. Application of management functions in work settings. The role and responsibilities of human resource management in an organization, job analysis and description, manpower analysis, performance management, training and development. Recruitment and selection processes, compensation and wages, career planning and development, management development, creativity and innovation, talent management, morale, productivity, industrial relationship, team management and group dynamism, participative management, conflict management. Labour legislation. Employee health and safety.

LIT 505: Business Ethics and Governances (2, 0, 0)

Ethical theories; meta-ethics. Individual and corporate responsibility in decision making; professionalization and code of conduct; treatment of employees; safety and dependability of products; environment and pollution; personnel policies; plant relocation; utilization and deontological concerns in business; cost of low ethical standards; ethical reputation and market valuation/cost of capital; organizational systems, structures and ethical practice; recruitment, management selection and ethical organization; the boards and corporate ethics; initiatives for integrity assessment and rating of companies and within companies; the issue of justice.

PMT 501: Computer Based Project Management (1,0,1)

Prerequisite: PRT 202.

The application of computers to the solutions of project management problems; Advance Network Analysis. This course is practical oriented and fashioned to equip students with an in-depth knowledge of using key project management software like Primavera, Microsoft Project, timeline, SureTrak, project workbench, Atermis, etc as tools to work through the project management life cycle from planning through execution. Using the basic elements of project management; scheduling, resources and cost, students will gain an overview of project management concepts, allocate resources, adjust project plans to account for any schedule delay and over allocated resources.

Utilization of spreadsheets, charts and tables for problem-solving and creating reports and presentations required for project management. Application of building information modeling (BIM) software to model building and infrastructure systems and construction processes. Computerized BIM applications to include integration of prevailing commercially available software.

Laboratory: The practical components will include; introduction to any of the software; Primavera, Microsoft Project, PRINCE 2, etc through navigation and overview; project structuring; creating a project; creating work breakdown structure (WBS) and modifying them; activities and relationships; managing project documents; adding constraints; resources and their roles; scheduling; formatting project data; base-lining project plan; reporting project performance; earned value analysis and calculating percent completion.

PMT 503: Project Planning & Control (1, 1, 0)

Content covers project planning, scheduling, network systems, and communications required for project execution and control. It includes designing project activities, logic diagramming, computing durations, and identifying resource requirements. Scheduling techniques presented are Critical Path Method (CPM), Project Evaluation and Review Technique (PERT), Location-Based Management System (LBMS), and Last Planner System (LPS). Resource Allocation. Resource Aggregation. Resource Leveling (Smoothing); Resources Ceiling (Multiple and Single Resource Types). Method of moments for resource smoothing, Heuristic procedure for resource smoothing. Scheduling Limited Resource. Time-Cost Trade-off Analysis. Activity Time-Cost Relationship. Project Time-Cost Relationship. Shortening Project Duration (Project Crashing). Developing Cost Curves. Expenditure Control Loop (S-Curve). The Earned Value Concept. Cost Variance. Schedule Variance. Brief introduction of commercially available scheduling software, like Microsoft Project, Primavera, Function Fox, etc.

Laboratory: Software development and use of personal computers in design. Application of integrated computer-aided design and manufacturing of selected discrete parts and components of final projects of individual students.

Laboratory: Grinding, drilling, boring, broaching, casting, welding, forging and metal forming. Project on manufacturing planning. Production of spur, helical and bevel gears, and unconventional machining techniques.

PMT 509: Contract Administration (2,0,0)

Contract Law and its development; Courts and remedies; General Survey of Decree 51 known as Companies Act 1968 and as amended. Incorporation of companies and incidental matters; Law of contracts; Types of contract, Contractor's obligation to carry out and complete the works, Definition of works, Variations to work, Quality control, Defects, Protection of employer in relation to: Non-performance retentions, bonds, sureties etc.

Sales and Right of parties: Agency; classification, appointment, authority, duties and rights of agents/principal; termination of agency. Special types of contract; sale of land and goods; estate agency; contracts of employment. Nature, types and formation of construction contracts; parties to a construction contract; role of Architects, Engineers, Quantity Surveyors, Project managers, and sub-contractors etc. Overview of dispute resolution mechanisms (Alternate dispute resolution, DRBs; Arbitration procedures; Issues related to contract administration, etc.); Contracts for procurement of

professional services. Nature of Contract Management; Stage by Stage Evaluation; CPM Application to ensure early execution of contract; Problems of contractor financed capital projects.

CSC 511: Artificial Intelligence & Expert Systems (1,0,1)

Basic definitions: Data, knowledge, intelligence, artificial intelligence; Tree-structure representation of data/knowledge and Intelligent search methods; Basic Structure of knowledge-based system; Knowledge Engineering: Knowledge acquisition, knowledge representation schemes, inference mechanisms, Explanation facilities; Introduction to subfields of AI: Expert systems technology, Fuzzy Systems, Machine learning, Genetic algorithms, Genetic programming, Symbolic Logic and Automated Reasoning, Neural networks, Approximate reasoning system, Game playing; Robots and Vision Systems; AI programming languages and systems: Lisp, Prolog, Smalltalk, Expert system shells; New trends; Applications and case studies.

IFT 507: Software Engineering and Practice (2,1,0)

Types and uses of general and special purpose software; General Design, Implementation, Development and Maintenance of software for use by management, organizations, and individuals; program writing, debugging, documentation using flowcharts, decision tables and other techniques; Designing, writing and compiling of program packages for special or specified applications, or for general use in an industry; modifying and re-engineering an existing software for other uses, development and application of Data warehouses, software that manage data warehouses and Information Highways. Definition and conceptual framework of software engineering. Role of management in software development. Software lifecycle models. Software requirement, analysis and specification. Software reliability and testing. Software design. Software maintenance and certification. Software project planning and estimation.

500 LEVEL RAIN SEMESTER

PMT 502: Project Design & Environmental Impact Assessment (1, 0, 1)

Definition of design, generation of project ideas, Project identification and analysis; Project Objectives, Project Inputs, Activities, Project Outputs, Project Specification, Design Methodology, Project Design and scope management; work breakdown structure, schedule milestone, layout, configuration structure drawing. Prerequisite for project/System design; value analysis and value engineering. Bill of material, bill of quantity. The Project/Systems architectural design Process; Design trade-off analysis; Evaluation of Design effectiveness; Technical analysis of Project Design for implementation; Engineering materials selection, requirements and properties in project design; Stress-strain analysis and factor safety. Impact of development projects Sustainable development- Definitions of EIA, EIA and project location. Objectives of EIA. Process of EIA. Need for Environmental Impact Assessment (EIA)-Environmental Impact Statement (EIS). EIA capability and limitations, Legal provisions on EIA-Stages of EIA, Types of EIA, Methods of EIA Check lists, Matrices, Networks, Cost-benefit analysis, Analysis of alternatives.

Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna-Mathematical models-Public participation. Plan for mitigation of adverse impact on environment Options for mitigation of impact on water, air, land and on flora & fauna-Addressing the issues related to the Project Affected People. Post project monitoring.

EIA for infrastructure projects: Dams, Highways, Multi-storey Buildings, Water Supply and Drainage Projects, Waste water treatment plants, STP.

LIT 502: Cost and Management Accounting (2, 0, 0)

Course description: This course is aimed at giving students an insight into cost and management accounting. This is very useful tool because this branch of accounting not only provides companies' management with information for decision making but also helps them optimally utilise existing

resources. This is a very important knowledge and skill for our graduates to have to compete in whatever field or industry they choose to work.

Course contents: Introduction to cost and management accounting, classifications of costs, cost centers, cost analysis, elements of costs, learning curve and linear programming techniques, information planning and control, forecasting, inventory, capital budgeting decisions, costing methods and techniques (including just-in-time costing, backflush costing, life-cycle costing, target costing), budgeting and budgetary control, advance manufacturing techniques, cost-volume-profit analysis (including break-even analysis, margin of safety, graphical analysis etc).

PMT 504: Project Risk & Safety Management (2,0,0)

Risk Management and Project risk management. Overview: Definition of risk; tolerance for risks; Definition of Certainty ; risk and Uncertainty; Risk Management Methodology; Risk Identification; Risk Quantification, Risk Response Control; Estimating High Risk Projects; The Monte Carlo Process; Risk Management Assessment. Legal and ethical consideration of project risk, examples drawn from large engineering projects, software development, systems integration and construction.

Detection and control of Hazards. Safety planning; safety plan execution; sources of safety plan development; law and regulations, contract requirements, safety policy, site location, management's commitment. Techniques for safety plan development; hazard analysis, sub-contractor selection, Accident investigation and analysis of data. Environmental modification for safety effectiveness and accident prevention. Safety codes. Material handling. Machine guarding. Electrical hazards. Case studies on special occupational hazards. Causes and characteristics of accident proneness, Incidence of fire & its Prevention, Electrocution & its Precautions. Principles to Prevent Accidents, Legal, humanitarian & economic reasons to Prevent Accidents, Safety Measures & Procedures, Safety equipment, OHSAS 18000.

PMT 506: Project Cost Estimation and Tendering (1,1,1)

Cost Estimating: Estimating as formulation of a bid. Estimating and bidding procedures. Identifying activities/operations involved in different type of projects; use of standard methods of measurement for civil and building works SMM, CESMM etc. Determination of quantities of work: taking off. Load bearing and framed structures, Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof Various types of arches, Calculation of brick work and RCC works in arches, Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

Estimating of septic tank, soak pit, sanitary and water supply installations, water supply pipe line, sewer line tube, well open well, estimate of bituminous and cement concrete roads estimate of retaining walls, culverts, estimating of irrigation works, aqueduct, syphon, fall.

Estimation of rates: Theory and practice of estimating materials, labour, equipment, overhead costs and other cost factors for various types of project activities. Data Schedule of rates, Analysis of rates, Specifications, sources, Preparation of detailed and general specifications, Tenders, TTT Act, e-tender Preparation of Tender Notice and Document, Contracts: Types of contracts, Drafting of contract documents, Arbitration and legal requirements.

Preparation and use of bill of quantities (BOQ)/ bill of engineering measurement and evaluation (BEME) in determining the final cost of a project. Activity-Based-Costing (ABC) and other approaches: Lifecycle costing. Necessity: Basics of value engineering, Capitalised value, Depreciation, Escalation, Value of building, Calculation of Standard rent, Mortgage, Lease Principles for report preparation, report on estimate of residential building: Culvert, Roads.

Water supply and sanitary installations, Tube wells, Open wells.

Tendering: Legal interpretation as an offer, purpose of tendering: forms of tender-bill of quantities/materials; schedules of rates; types of tender-standing offer; simple offer; tendering and contract formation.

Tendering Arrangements: Open, Selective (single and double stage), negotiated, serial, package deal; Pre-qualification of construction agencies; Development of procurement documents; Evaluation of contract bids; Integrated Project Delivery method of project delivery, design and build, BOT, PPP, DBOT, BOOT, BOT, DBFMO, etc); tendering procedure; tender documents-purposes/use, content. etc. The role of the quantity surveyor/cost engineer in tendering and tender analysis/reporting; Procurement and Contract Choices;- Procurement methods; standard forms of contract; contract terms/clauses; roles and obligations of parties.

PMT 508: Maintenance Management (2,0,0)

Concepts and importance of maintenance: Definitions, Causes of defects/failures/malfunctions in the environment and machines, maintenance needs, resources, for maintenance, maintenance manuals/equipment, etc. Types/Nature of maintenance: Maintenance Systems - planned, unplanned, adhoc, etc. Alterations and improvements, Maintenance Economics: specifications, measurements, measurement and pricing of maintenance work, cost-in-use, life-cycle cost. Planning and financing of maintenance work: Maintenance management-contract and direct labour, organization, maintenance contracts and agreements, quantitative techniques in maintenance management. Repairs: Repairs, Replacement policies.

Equipment for maintenance. Decay of Building and sick building syndrome. Agencies involved, alterations, conversion, extension, improvement in building, dimensional considerations, design defects and remedies, Structural surveys of buildings and schedule of dilapidation, Maintenance of all types of buildings, mechanical services. Management aspects of building maintenance. Maintenance cycles for different types of buildings, standard expected of buildings. Maintenance strategies repair/replacement theory, sensitivity analysis. Planning maintenance, Resources required, programs execution, appraisal policy guidelines. Application of other Operation Research and other General Management Techniques to Building Maintenance. Landlord/Tenant relationship and other legal matters.

PMT 510: Production Planning and Control (1,1,0)

Course overview and Principles of Operations and Productivity; Operations Strategy for Competitive Advantage; Forecasting Demand; Design of Goods and Services; Process Strategy and Capacity Planning; Facilities Management: Layout Strategies (1 week), 7. Material Handling; Supply-Chain Management; Materials Management: Inventory Management and Problems; Production Planning for New Technologies: Just-in-time Systems, Lean Manufacturing, and Agile Manufacturing; Master Production Planning and Materials Requirements Planning (MRP); Production Planning: Line Balancing Methods (Heuristic and Stochastic); Production Planning: Aggregate Scheduling, Shop Loading, Sequencing.

PMT 512: Automated Manufacturing Systems and Technologies (1,0,1)

COURSE OBJECTIVES: Describe the basic concepts of automation in manufacturing systems; Acquire the fundamental concepts of automated flow lines and their analysis; Classify automated material handling, automated storage and retrieval systems; Illustrate adaptive control systems and automated inspection methods.

COURSE OUTCOMES: Upon completion of this course the student will be able to:

1. Illustrate the basic concepts of automation in machine tools.
2. Analyze various automated flow lines, Explain assembly systems and line balancing methods.
3. Describe the importance of automated material handling and storage systems.
4. Interpret the importance of adaptive control systems, automated inspection systems.

INTRODUCTION: Machine Tools, Cad/Cam. Single-Station Manufacturing Cells, types and strategies of automation, Automation in machine tools, automation principles, Mechanical feeding and tool changing, machine tool control, elements in product realization.

AUTOMATED FLOW LINES: Methods of work part transport, transfer mechanisms, buffer storage, control function, Design and fabrication consideration.

ANALYSIS OF AUTOMATED FLOW LINES General terminology, analysis of transfer lines with and without buffer storage, partial automation, implementation of automated flow lines.

ASSEMBLY SYSTEMS AND LINEBALANCING: Assembly process, Manual Assembly Lines, Line balancing methods, ways for improving line balance, flexible assembly lines.

AUTOMATED MATERIAL HANDLING: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

AUTOMATED STORAGE SYSTEMS: Automated storage and retrieval systems work in process storage, inter facing and line and storage with manufacturing.

PMT 514: Construction Economics & Management (1,1,0)

Meaning of construction economics. Value and investment-methods of valuation, Introduction to investment valuation; Cost benefit analysis. Factors affecting demand/value of property; rental values. Economics of pre-fabrication and industrialization of residential developments; assessment of demands for development; aims of developers (public and private developers). Constraints faced by developers; effects on development; choice and acquisition of site; developers' budget; land use and value determinants, Environmental economics. Cost control terminologies; cost implications of design variables; Cost implication of construction methods. The effect of legislation, taxation and grants on cost. Maintenance and operational costs.

Introduction to construction management including industry divisions and sectors, stakeholders, organization structures, project delivery methods, and contracting. Overview of the roles of management and the trades, resources, safety, environmental issues, ethics, and codes, standards, and regulations. Applying construction management knowledge and tools to developing and constructing single and multifamily projects. Project life cycle includes; conceptualization and feasibility, preconstruction service, construction, and closeout. Introduction and application of the Value Management framework. Intent on how to develop knowledge and skill in the estimating process from takeoff through preparation of the final bid. Introduction to conceptual estimating, developing unit prices; markups for overhead, contingency, and profit; and ethical practice. Includes a brief introduction to commercially available estimating software. construction site organization, personnel, documentation and regulations, accounting, execution of works, risk management.

PMT 516: Quantification & Costing of Construction Works (2, 0, 0)

Demonstrate knowledge and understanding of the principles of quantification and costing of construction works as a basis for the financial management of contracts. The quantification of construction works (including both measurement and definition). The various standard methods of measurement. The costing of construction works. The measurement of buildings and structures to agreed standards. Quantifying construction works at the various stages of a project. Producing pricing documents such as bills of quantities, schedules of activities/works, schedules of rates or contract sum analyses. Carrying out the costing of construction works by methods such as tendered rates, quotations or day works. Advising on appropriate methods of measurement and costing. Selecting of appropriate pricing documents. Negotiating and agreeing the valuation of construction works at various stages of the project such as the contract sum, construction and final account.

The meaning and functions of specification, parties associated with the building contract architect, quantity surveyor, consulting engineers, contractors or builders etc. contract documents-types, incorporating specification. Relationship between drawing and specification, specification writing procedures, sub-division of the specification into sections. Techniques, languages, standards and codes of practice. Example for both building and civil engineering works

IFT 508: Systems Implementation & Evaluation (2,0,0)

Negotiating and agreeing procedures and plans for implementation, monitoring and maintenance of a new system. The tools of project management, project team concepts, monitoring criteria, organization control, system changeover. Information and advising on relevant aspects of the nature, purpose, function and operations of the system to appropriate personnel. Software upgrades; role of database administrator, system/network manager. Software and hardware documentation. Minimizing the possibility of system failure; backup systems; log file systems. Obtaining and analyzing information on system operations. The need to measure system performance. Error detection and correction, meeting new user's requirements, flexibility and adaptability, integrity, effect of increasing volumes of transactions and users. Systems modification/criteria for the changing and upgrading of systems.

Training and retraining, help lines, user groups. Trends making evaluation necessary. Steps in planning an evaluation. Resistance to evaluation. Identifying, agreeing and documenting criteria for evaluating systems: systems proposal, software design and documentation tools, benchmarking, conversion plans. Equipment trials: Evaluation of information systems (hardware/software) against agreed criteria using hardware/software monitors, system logs and observations, scheduling analysis. Switching costs and costs of locking into manufacturers. Measuring software efficiency: speed estimation, benchmark, compiler comparisons, and direct measurements. Drawing conclusions from the evaluation and proposing an optimal system. Explaining, negotiating, agreeing and documenting system modifications.

IFT 502: Computer Modelling & Simulation (1,0,1)

Formulation of simulation problems, the formulation and evaluation of mathematical models used in simulation: mathematical modeling and applications. The design of simulation experiments and the analysis of simulation data techniques for generating random numbers and stochastic varieties for simulation; overview of simulations languages GSS, DYNAMO, etc. the students are expected to run on a computer several small simulation problems in each of these languages. Simula and Matlab Applications.

PMT 518: Circular Economy (2,0,0)

Course is focused on introduction to concept of circular economy with special emphasizes especially in energy sector. Economic, societal and environmental perspective is presented on the basis of integral approach to a resource efficient future, necessitating cooperation of all stakeholders along the value chain. This links product and service design, supply chain management, manufacturing technologies, product and service use, product treatment at end-of-life, and business models and strategies such as portfolio management and branding.

PMT 500: Final Year Research Project (0,0,6)

This is a research work carried out by each student in any specific problem area in Project Technology and Logistics and in line with their various option areas. The essence is to find solutions to existing or potential problem areas in the execution of projects. It is expected that students submit proposals on their areas of interest by the end of their fourth year in order to enable them start work in the Harmattan semester of their fifth year. The final work would be defended towards the end of the rain semester of the fifth year.