DEPARTMENT OF BUILDING

OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE

DEPARTMENTAL HANDBOOK

UNDERGRADUATE PROGRAMME

1.0 ADMISSION REQUIREMENTS

Admission to the department can be satisfied by meeting the general University admission requirements as well as passing the relevant Senior Secondary School Certificate (SSC) Examination (or its equivalent) in the relevant subjects. A candidate can also be admitted to higher levels by meeting the basic and other requirements as stated below.

Admission to Part I: Through UTME (University Matriculation Examination)

To be eligible for admission, candidates must pass the SSC Examination or its equivalent at credit level in not less than 5 subjects and in not more than two sittings in Mathematics, Physics, Chemistry and English Language and any other subject selected from Technical Drawing, Economics, Further Mathematics, Fine Arts, Geography, Land Surveying and Building Construction.

UTME subjects: English Language, Chemistry, Physics and Mathematics or Technical Drawing

Direct Entry Admissions:

a) Candidates for Direct Entry to Part II should have GCE (A) level or its equivalent with passes in Mathematics, Physics and Chemistry in not more than two sittings. In addition, candidates must satisfy the general entry requirements for admission to Part I as listed in 4(1)

b) Holders of National Diploma (ND/OND) or its equivalent at not less than Upper Credit level in Building, Architecture, Quantity Surveying and Civil Engineering may be considered for direct entity to Part II provided that they:

   (i) score not less than 60% at ND level and the subjects passed must include Mathematics and other science courses offered at ND II level (for example, basic courses in Structures and Building Science)

   (ii) satisfy the entry requirements as stated in 4(1)

c) Holders of Higher National Diploma (at not less than Lower Credit level) Certificate in Architecture or Civil Engineering may be considered for admission to Part II provided they satisfy 4(2b) in addition to the general conditions stipulated in 4(1).

2.0 University Academic Regulations

Some University Examination Regulations that students should note as contained in University Examination Regulations for first Degrees, Diplomas and Certificates are:

2.1 Registration for University Examinations

(a) A candidate for a University examination must have registered the courses in the prescribed format not later than the closing date prescribed for registration for such courses. Any candidate who fails to register for courses at the appropriate time as prescribed by Senate will not be allowed to take any examination in such courses. Any examination taken without course registration shall be null and void.

(b) Students who registered for courses are committed to the number of units registered for and are expected to take examinations in such courses. If a student failed to take an examination he would be scored '0F' for the number of units he had registered for and in which he had failed to take the prescribed examination.

(c) Any student who does not have any course to offer in a particular semester should apply for leave of absence.

(d) A candidate who has less than 15 units in a particular semester to graduate should apply to his/her Faculty Board for permission to register for less than 15 units. Failure to do so constitutes a breach of regulation which may result in the non-processing of the candidate's results.

(e) A candidate, who cannot register for courses during the prescribed period for registration because of an illness must ensure that medical report on his illness is forwarded by him or his parents/sponsors to reach the Dean of his Faculty not later than four weeks after the end of the normal registration period as scheduled in the University Calendar. Such a medical report should be forwarded for authentication by the Director of Medical and Health Services for it to be considered valid. Such a candidate shall be exempted from the penalties of late registration. All applications should be routed through the Head of Department.

(f) Students must attend a minimum of 75% of course instructions including lectures, tutorials and practical where required to qualify to sit for examination in any course.

2.2 Absence from Examination

Candidates must present themselves at such University examinations for which they have registered. Candidates who fail to do so for reason other than illness or accident shall be bound by the following regulations:

(a) Any student who fails to register for courses during one semester without permission should be deemed to have scored '0F' in the minimum number of units required for full-time students (i.e. 15 units).

(b) Candidates who registered for courses, attended classes regularly, did all practical and tests but did not take required semested examinations should be given a continuous assessment grade in each of the affected courses and a grade of '0F' in the examination which they should have taken, but which they did not take.

(c) Candidates who have less than 15 units to graduate but fail to take the required examinations should be deemed to have scored '0F' in the outstanding courses only provided such candidates obtained permission to register for less than 15 units.

(d) Any candidate who on account of illness, is absent from a University examination may be permitted by the Senate on the recommendation from the appropriate Faculty Board, to present himself for such examination at the next available opportunity provided that:

i. A full-time student in the University shall report any case of illness to the University Health Centre at all times.

ii. When a student falls ill during examination, he should report to the Director, Medical and Health Services before attending any hospital outside the University. A report of sickness should be made to the Registrar within a week and a medical certificate of validation of his illness within three weeks.

iii. When a student falls ill before an examination he shall be under an obligation to send a medical report countersigned by the Director, Medical and Health Services within one week of such illness. Any time outside this period, shall be considered on its merit.

iv. The Director of Medical and Health Services should within 48 hours, submit a medical report on a candidate who is ill during an examination and is taken to the Health Centre or referred by it to the hospital for treatment.

v. A candidate applying for leave of absence on medical grounds must forward his application together with a medical report to the Dean of his Faculty through his Head of Department. The Director, Medical and Health Services must countersign the Medical Report. The appropriate Faculty Board must take all applications for Leave of Absence.

2.3 Examination Offences

(a) A candidate shall not be allowed during an examination to communicate by word or otherwise with any other candidates nor shall he leave his place except with the consent of an invigilator.

Should a candidate act in such a way as to disturb or inconvenience other candidates, he shall be warned and if he persists he may, at the discretion of the invigilator be excluded from the examination room. Such action by the invigilator must also be reported in writing through the Head of Department to the Vice-Chancellor within 24 hours.

(b) It shall be an examination offence for any student, staff or any person whatsoever, to impersonate a candidate in any University examination. Any student or staff of the University found guilty under this regulation shall be subjected to disciplinary action by the appropriate authority of the University.

(c) No candidate shall take into an examination room or have in his possession during examination any book or paper or printed or written documents, whether relevant to the examination or not, unless specifically authorized to do so. Any invigilator has authority to confiscate such documents.

(d) Mobile phones are not allowed in examination halls.

(e) A candidate shall not remove from an examination room any papers, used or unused, except the question paper and such book and papers, if any, as he is authorized to take into the examination room.

(f) Candidates shall comply with all "direction to candidates" set out on an examination answer book or other examination materials supplied to them. They shall also comply with duration given to them by an invigilator.

(g) Candidates shall not write on any paper other than the examination answer books. All rough work must be done in the answer books and crossed out neatly. Supplementary answer books, even if they contain only rough work must be tied inside the main answer books.

(h) When leaving the examination room, even if temporarily, a candidate shall not leave his written work on the desk but he shall hand it over to an invigilator. Candidates are responsible for the proper return of their written work.

(i) Smoking shall not be permitted in examination room during examination sessions.

(j) Any candidate or staff who attempts in any way to unlawfully have or give pre-knowledge or an examination question or to influence the marking of scripts or the award of marks by the University examiner shall be subject to disciplinary action by the appropriate authority of the University.

(k) If any candidate is suspected of cheating, receiving assistance or assisting other candidates or of infringing any other examination regulation, a written report of the circumstance shall be

submitted by the invigilator to the Vice-Chancellor within 24 hours of the examination session. The candidate concerned shall be allowed to continue with the examination.

(l) Any candidate suspected of examination malpractice shall be required to submit to the invigilator a written report immediately after the paper. Failure to make a report shall be regarded as a breach of discipline. Such report should be forwarded along with the invigilator's report to the Vice-Chancellor.

(m) Where a Head of Department fails to forward a report on examination malpractice to the Vice-Chancellor such action would be considered misconduct.

3.0 Prospectus

3.1 Undergraduate Benchmark Minimum Academic Standards (BMAS) Programme

HARMATTAN SEMESTER PART I

CODE	COURSE TITLE	Pre-requisite	L	T	P	U
BLD 101	Introduction to Building and Environment I		1	0	3	2
URP 103	Nature of Environmental Science		1	0	3	2
ARC 103	Graphic Communication		0	0	6	2
MTH 101	Elementary Mathematics I		4	1	0	5
PHY 101	General Physics I		3	1	0	4
CHM 101	Introduction to Chemistry I		3	1	3	4
CHM103	Experimental Chemistry I		0	0	1	1
PHY 107	Experimental Physics 1A		0	0	3	1
	Special Elective		2	0	0	2
	Total		14	3	18	23
RAIN SEMESTER PART I						
BLD 102	Introduction to Building and Environment II		1	0	3	2
MTH 104	Vectors		2	0	0	2
MTH 102	Elementary Mathematics II	MTH 101	4	1	0	5
PHY 102	General Physics 1B	PHY 101	3	1	0	4
PHY 108	Experimental Physics 1B		0	0	3	1
CHM 102	Introduction to Chemistry II		3	1	3	4
CHM 104	Experimental Chemistry II		0	0	1	1
	Special elective		2	0	0	2
	Total		15	3	9	21

HARMATTAN SEMESTER PART II

CODE	COURSE TITLE	Prerequisite	L	T	P	U
BLD 201	Building Construction and Materials II	BLD 102	1	0	3	2
BLD 203	Structural Mechanics and Strength of Materials I	PHY 101	2	0	3	3
BLD 205	Building & Architectural Science		1	0	3	2
ESM 203	Land Surveying I		1	0	3	2
QTS 201	Principles of Measurement and Description I		1	1	3	3
CSC 201	Computer Programming I		2	0	3	3

CHE 201	Engineering Thermodynamics		2	0	3	3
MTH 201	Mathematical Method I	MTH 101/102	3	1	0	4
	Total		15	2	21	24

RAIN SEMESTER PART II

CODE	COURSE TITLE	Prerequisite	L	T	P	U
BLD 202	Building Construction and Materials II	BLD 201	1	0	3	2
BLD 204	Structural Mechanics and Strength of Materials II	BLD 203	2	0	3	3
BLD 206	Soil Mechanics		1	0	3	2
ESM 204	Land Surveying II	ESM 203	1	0	3	2
QTS 202	Principles of Measurement and Description II	QTS 201	1	1	1	3
CSC 208	Computer Programming		1	0	3	2
MTH 202	Mathematical Method II	MTH 101/102	3	1	0	4
	Special Elective		2	0	0	2
	Total		13	2	21	22

LONG VACATION

BLD 200 SIWES 0 0 9 3

HARMATTAN SEMESTER PART III

BLD 301	Building Construction and Materials III	BLD 202	1	0	3	2
BLD 303	Construction Technology I	BLD 202	2	0	3	3
BLD 305	Building Maintenance I		1	0	3	2
BLD 307	Building Services and Equipment I		2	0	3	3
BLD 309	Theory of Structures	BLD 204	2	0	3	3
SSC 201	Statistical Methods and Sources I		2	1	0	3
QTS 303	Tendering and Estimating I	QTS 202	2	0	3	3
MEE 303	Fluid Mechanics		1	0	3	3
	Total		15	1	21	22

RAIN SEMESTER PART III

BLD 302	Building Construction and Materials IV	BLD 301	1	0	3	2
BLD 304	Construction Technology II	BLD 303	2	0	3	3
BLD 306	Building Maintenance II	BLD 305	1	0	3	2
BLD 308	Building Services and Equipment II	BLD 307	2	0	3	3
BLD 310	Design of Reinforced Concrete Structures I		2	0	3	3
BLD 312	Project Planning and Control		2	0	3	3
SSC 202	Statistical Methods & Sources II	SSC 201	2	1	0	3
QTS 304	Tendering and Estimating II		2	0	3	3
	Special Electives		2	0	0	2
	Total		16	1	21	24

LONG VACATION

BLD 300 Industrial Training 0 0 9 3

HARMATTAN SEMESTER PART IV

BLD 401	Structural Analysis	BLD 309	2	0	3	3
BLD 403	Design of Reinforced Concrete Structure II	BLD 310	2	0	3	3
BLD 405	Principle of Construction Managements	BLD 312	1	1	3	3
BLD 407	Building Services and Equipment III		2	0	0	2
BLD 411	Integrated Studio Project		0	0	9	3
QTS 305	Building Economics I		2	1	0	3
QTS 409	Introduction to Building Contracts		2	0	0	2
	Sub-Total		11	2	18	
	Electives of 2/3 units from below					
	Restricted Electives					
URP 307	Rural Development Planning		2	0	3	3
QTS 301	Measurement of Const. Works	QTS 202	2	0	3	3
QTS 405	Construction Economics		2	0	0	3
ESM 201	Introduction to Valuation		1	0	3	2
MME 201	Introduction to Engineering Materials		2	0	3	3
	Grand Total					21/22

RAIN SEMESTER PART IV

BLD 400	Industrial Training	0	0	27	9

HARMATTAN SEMESTER PART V

BLD 501	Advanced Construction Technology I	BLD 303 & BLD 304	2	0	3	3
BLD 503	Management of Building Project	BLD 405	1	1	3	3
BLD 505	Professional Practice		1	1	0	3
BLD 507	Project Dissertation I		0	0	9	3
QTS 403	Tendering and Estimating III		2	0	3	3
	Sub-Total 4/5 units from an appropriate option below		6	2	18	14
	Grand Total					18/19

RAIN SEMESTER PART V

BLD 502	Advanced Construction Technology II	BLD 501	2	0	3	3
BLD 504	Advanced Project Management	BLD 503	1	0	3	2
QTS 306	Building Economics II	QTS 305	2	1	0	3
BLD 506	Design of Steel structures		2	0	3	3
BLD 508	Project Dissertation II	BLD 507	0	0	9	3
	Elective of 4/5 units from an appropriate option below		7	1	18	14
	Grand Total					18/19

PART V ELECTIVES

CONSTRUCTION MANAGEMENT

HARMATTAN SEMESTER

BLD 509	Construction plant & equipment		1	0	3	2
BLD 511	Highway Engineering		1	0	3	2
BLD 537	Computer Applications in Building		0	0	6	2
BLD 503	System Analysis in Construction		1	0	3	2
CSC 501	Introduction to Operation Research		2	1	0	3
RAIN SEMESTER						
BLD 510	Productivity Studies on Sites		1	0	3	2
BLD 512	Building Materials Production Process		1	0	3	2
BLD 514	Construction Budgeting and Finance		1	0	3	2
BLD 516	Information System and Management		1	0	3	2
	BUILDING STRUCTURES					
	HARMATTAN SEMESTER					
BLD 511	Highway Engineering		1	0	3	2
BLD 515	Technology and Masonry Design		1	0	3	2
BLD 517	Design of Timber Structures		1	0	3	2
BLD 519	Advanced Structural Analysis		1	0	3	2
BLD 521	Fundamentals of Geotechnology		1	0	3	2
BLD 537	Computer Applications in Building		0	0	6	2
	RAIN SEMESTER					
BLD 518	Design of Highway Structures		1	0	3	2
BLD 520	Advanced Masonry Design		1	0	3	2
BLD 524	Advanced Design of Concrete Structures		1	0	3	2
BLD 526	Advanced Geotechnology		1	0	3	2
BLD 528	Advanced Design of Steel Structures		0	0	6	2
BUILDING SERVICES HARMATTAN SEMESTER						
BLD 523	Acoustics		1	0	3	2
BLD 525	Lighting		1	0	3	2
BLD 527	Advanced Building Services Design Theory		1	0	3	2
BLD 529	Thermal Environment		1	0	3	2
BLD 537	Computer Applications in Building		0	0	6	2
EEG 413	Electrical Energy Distribution		1	0	3	2
CSC 501	Introduction to Operations Research		2	1	0	3

RAIN SEMESTER						
BLD 538	Advanced Maintenance Technology II	`	1	0	3	2
BLD 540	Maintenance of Building Mechanical System		1	0	3	2
BLD 514	Construction Budgeting and Finance		1	0	3	2
BLD 516	Information System and Management		1	0	3	2

BLD 101 – Introduction to Building and Environment I

1. History of Building; Functions and Types of Buildings.
2. The Professional Builder
    - Definition; scope of duties; future prospects; relationship with other professionals in the Construction Industry
3. Analysis of the various options available in the Building Profession – Construction Technology, Building Services, Construction Management, Building Maintenance and Building Structures.
4. Functions and illustration various building elements and components – foundations, floors, walls, beams, lintels, columns, roofs, windows, doors, etc.
5. Visit to construction sites.

BLD 102 – Introduction to Building and Environment II

1. Drawing Instruments, layout of drawings and geometric constructions
   Multiview drawings and graphical representation.
2. Traditional Housing Design and Development in Nigeria
3. Elemental composition of a building in relation to the environment and functional requirements
4. Brief discussion on plant and equipment required on construction site
5. Organisational Structure and Personnel involved in Construction
6. Local Materials utilisation in low cost mass housing
7. Socio-cultural and climatic condition as they affect building design in Nigeria
8. Analytical tools for problem solution in building provision
9. Economic factors affecting building provision: economics and concepts of production, methods of production, pricing methods
10. Building drawings
11. Presentation of road designs and simple examples of other Civil Engineering drawings.

BLD 201: Building Construction and Materials I

1. Site operations and construction personnel
2. Site Investigation and Site Preparation Processes
   Site Organisation and Layout, Clearing, Levelling and Setting out.
3. Excavations – soil classification, methods of excavation (manual/mechanical). Tools for manual excavation.

Problems of excavation (including Site Drainage) and timbering to excavation.

4. Design and construction detailing of elements of building.

   – Foundations (to include subsoil/loading conditions).

   - Floors – soil ground floors, Raised/Upper timber floors.

   Solid upper floors.

   Finishes.

5. Modelling of building elements and components.
6. Practicals

BLD 202: Building Construction and Materials II

1. Walls: Load-bearing and Non load-bearing walls, Timber walling, Stones wall, Brick/block Walls, Bonding, mortar mixes, d.p.c., Wall finishes – plastering, rendering, tyro-leaning, painting, etc.
2 Openings in walls: Doors, Windows, Lintels, beams and columns, Arches.
3. Stairs and fittings
4. Roofs and ceilings
5. Drainage – tools, equipment, materials and methods of installation
6. External Works and Landscaping: Fences and Fencing, Gates, Access roads, Landscaping.
7. Preparation of Architectural and Construction Drawings of a simple building up one-storey building.
8. Modelling of building elements and components.
9. Practicals

BLD 203: Structural Mechanics and Strength of Materials I

1. Introduction to mechanics and design of building structures. The object of structural design
2. Statics of Particles – Forces in a plane, Forces in space
3. Statics of Rigid bodies in two dimensions
4. Statics of rigid bodies in three dimensions
5. Properties of structural sections – centroid, First Moment of Area, Moments of Inertia, Compound, Sections Radius of Gyration, Polar moment of Inertia, Section modulus, Principal axes and Principal moments of inertia. Mohr's circles for moment and product of Inertia.

6. Direct stress and strain – tension and compression. Stress/strain curves, Hooke's law, Poisson's effect, factor of safety, strain energy, initial stresses, suddenly applied loads, falling loads, creep under loading, fluctuating stress, fatigue under repeated stresses,
7. Analysis of statically determinate structures: Trusses (Method of Joints, sections and graphical methods, calculation of displacement of joints), Beams, Frames, Cables, Shear force, axial force and Bending moment relationship and diagrams.
8. Influence lines for trusses and simply supported beams.

BLD 204: Structural Mechanics and Strength of Materials

1. Shearing Stresses
2. Analysis of stress and strain (2/3 dimensions)
3. Longitudinal stresses in Beams
4. Shearing Stresses in Beams
5. Beams of Two Materials
6. Combined Bending/Direct Stresses
7. Torsion
8. (a) The Principle of Virtual work and its applications
   (b) Strain Energy/Complementary Energy and Applications
9. Deflection of Statically Determinate Beams using different approaches
10. Elastic Buckling of columns and Beams
11. Vibration in Beams

BLD 205 – Building and Architectural Science

1. Environmental Physics – heat, light, sound
2. Psychophysics; Thermal design
3. Ventilation and Air Conditioning
4. Lighting System, light and illumination
5. Daylight in building
6. Noise and Building
7. Acoustics, sound, reverberation and sound Insulation

BLD 206 – Soil Mechanics

1. Introduction to soil theory
2. Properties of soil, their classification, behaviour etc.
3. Soil water, permeability and flow seepage problems
4. Strength and deformation of soils
5. Stability of slopes; earth pressure
6. Soil stresses, settlements and movements due to loading
7. Bearing capacity of soils, foundation settlement
8. Geotechnical investigation and tests
9. Soil strengthening and stabilization; lowering ground water
10. Binding agents and their effects/properties; soil exploration

BLD 208 – Business Organisation and Accounts

The course exposes the students to the financial activities of Building Contracting Firms

- The form of business organisation
- The purposes and use of accounting for various enterprises
- Basic accounting theory and its application to the needs of the building industry in general and construction project in particular;
- Methods of cost accounting and control, the financing of business organisation. The interpretation of company accounts.

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BLD 301 – Building Construction and Materials III

Detailed study of materials and their performance in construction including clay, concrete, stones, timber, plastics, bricks, paints, metals and alloys, glass, bitumen, synthetic and reinforced polymer products, etc. Production, processing, evaluation and testing method; utilisation in construction and associated problems. Advances in composite tropical materials including terracrete, shwishscrete etc
CASE STUDIES

(a) Clays in buildings: Clay products in buildings – foundation, floors, walls, ceilings, roofs, finishes; performance in buildings; maintenance problems. Maintenance aspects and associated problems.

(b) Plastic in buildings: Technology and manufacture; utilisation in buildings, performance in buildings, maintenance problems

(c) Glass in buildings: Technology and manufacture; utilisation in buildings; a critique of glass as external curtain, maintenance aspects. Problems.

(d) Timber in Buildings: timber products in buildings; performance in buildings, maintenance problems.

BLD 302 – Building Construction and Materials IV

- Concrete Technology
- Detailing a very simple building. Builders drawings. Production of site drawings
- Plants and Equipment and tools for builders
- Basement/Retaining wall construction and water proofing
- Plumbing – materials, methods/installation and pipe sizing
- Electrical installation
- Preparing schedules/specifications of finishes, doors, windows, reinforcement etc (This should include specification writing).
- Development of new building materials/adaptation
- Design and construction of temporary works

BLD303 – Construction Technology I

- Review of Site Investigation Processes, soil tests and general principle of foundation design (as taught in BLD 206).
- Preliminary operations to Foundation Construction
- Spread Foundations
- Buoyancy Rafts and Basements (Box foundations)
- Pier and Caisson Foundations
- Piled Foundations – Driving equipment and construction methods
- Geotechnical processes
- Protection of Foundation structures against attack by soils and ground water
- Walls – solid masonry, plain monolithic concrete, cross wall construction, reinforced masonry, diaphragm and fine walls, panel walls, party and separating walls, external facings and movement control

BLD 304 – Construction Technology II

1. Multi-storey Structures – the frame and load bearing wall, choice of appropriate structure. Framed Structures – steel frame, reinforced concrete (In-Situ and Pre-cast) frame, RC wall, prestressed concrete movement control
2. Floor structures – Upper floors – choice and construction. Movement control
3. Vertical Circulations – stairs, ramps and ladders
4. Roof Structures – Beams, trusses and girders, rigid/portal frames, shells, folded slabs, space frames, single-layer grids, double layer grids, folded lattice plates, barrel vaults, domes tension structures, etc. Movement control in structures.
5. Integration of Structures with services and equipment
6. Communication in Building
7. Underground and space surveys. Astronomy
8. Introduction to hydrologic/photogramatric surveys. Mass haul diagram and associated quantities.

PRACTICALS IN BLD 303/304

Setting out of physical structures including buildings, estate roads, highway drains, curves etc (To be carried out as practicals on site and workshop), Construction Workshop practice (Carpentrary, Bricklaying, Plumbing, etc).

BLD 305 – Building Maintenance I

This course deals with building maintenance technology. Decay of building – agencies involved. Alterations, conversion, extension, improvement in building dimensional consideration. Design defects and remedies. Structural survey of building, specification writing and schedule of dilapidations to include: Measurement of maintenance works, maintenance of mechanical/electrical services

BLD 306 – Building Maintenance II

The course deals with the 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 – resourses required, programme execution, appraisal policy guidelines. Applications of other Operation Research and other General Management Techniques to Building Maintenance. Landlord/Tenant relationship and other legal matters.

BLD 307 – Building Services and Equipment I

Hydrology, water and wastewater management:

Water Supply: prospecting, purification, storage and township boreholes, dams, network analysis, pipe sizing etc. distribution to communities, domestic, industrial and commercial application of fluid dynamics for solving practical problems, needs, statutory provision. Bye-Law requirements. Cold and hot water storage and distribution in buildings. Foul, surface water and real drainage, solid waste management (Refuse disposal, etc.) Sewage treatment/disposal. Detailed measurement of mechanical installations, drainage and external works. Related project work/examples of overall system design with calculations.

BLD 308 – Building Services and Equipment II

1. Analysis and theoretical/practical design of Lifts, Escalator, Hoists etc.
2. Gas: Production, township distribution and installation within-buildings etc. application of gas law and other relevant equations for solving practical problems
3. Fire: Analysis, causes, design, prevention and control, etc. principles of fire fighting and associated equipment, byelaw, regulations, codes affecting fire services etc.

   Visits to sites to appreciate the practical implication of the theoretical frame-works.

   Practical design for live projects.

BLD 309 – Theory of Structure

- Deflection analysis of statically indeterminate structures (beams and trusses)
- Analysis of statically indeterminate trusses – application of energy methods
- Analysis of statically indeterminate beams and frames using three moment equations, slope deflection equations and Hardy Cross method of moment distribution
- Cantilever and Portal Methods of Moment Distribution
- Column Analogy: Influence Lines applied to statically indeterminate structures

BLD 310 – Design of Reinforced Concrete Structures I

- Introduction to reinforced concrete structures
- Properties of steel and concrete
- The typical building frame – columns, main beams, secondary beams and slabs
- Introduction to reinforced concrete design – CP 114, CP 110, BS8110
- Serviceability limit states: cracking, deflection, anchorage, bond and curtailment

- Design of singly reinforced concrete beams, doubly reinforced and flanged beams including design for shear reinforcement
- Design of axially loaded columns.
- Design of simple one-way slabs, stair cases and two-way slabs.
- Structural Detailing

BLD 312 – Project Planning and Control

The course deals with the sequence, organisation and control of projects and the interrelationship between various professional groups involved in the development of capital projects.

- The meaning of management and its role in construction.
- The nature of capital projects – client, consultants and contractors.
- Management tools/techniques (CPM, Bar charts, LOB, etc.) Tender analysis.
- Building management procedures from inception to completion.
- Co-ordination; control and supervision of simple and multiple contracts, site layout, report for management.
- Financing capital projects; working capital flow of funds.
- Legal implication of building contract.
- Regional organisation of typical professional offices

BLD 401 – Structural Analysis

Introduction to Kani's method of moment distribution

Matrix methods of structural analysis: Application to beams, plane frames, trusses and grillage/grid (Plane and space) structures.

Plastic method of analysis

BLD 403 – Design of Reinforced Concrete Structures II

- Design and Detailing of columns subject to Moments including Biaxial Bending. Slender columns. Design of Plain and Reinforced concrete walls.
- Design and Detailing of Ribbed/Waffle slabs (solid or hollow blocks or voids), flat slabs.
- Design and Detailing of foundations: Pad (axially and eccentrically loaded), wall, strip and combined, Raft, Pile
- Retaining walls (gravity, counterfort and Cantilever)

- Design and detailing of water-retaining and precast concrete structures (Swimming pools, underground, surface and elevated tanks).
- Torsion in reinforced concrete
- Introduction to the design of prestressed concrete structures.
- Term Projects: (1) Complete Design and Detailing of a Multi-Storey. Reinforced concrete framed building (including design for ties) (2) Design and Detailing of a water-retaining structure

BLD 405 – Principles of Construction Management and Production Management

The course deals with management principles and practice generally, management science, organisation theory, their application to building projects

A Personnel Management: Communication and Communicating System, Introduction to decision theory, Financial and Cost Accounting, Financial and Cost Management, Appraisal and control of capital project from inception to completion.

B. Planning: Pre-tender planning, method statement; short-term and long-term planning and scheduling techniques. Materials supply. Purchasing allocation and levelling. Cost optimisation, cost control of site work. Safety on Construction site and quality management. Site meetings. Site records.

BLD 407 – Building Services III

Telephone and P.A. Services, National communications network, Communication within buildings, PAY, PABX, PMBX systems, Public Address Systems, Fire alarm systems related to communication, Advanced water supply and distribution networks for towns, industrial and domestics' purposes, Advanced wastewater management, Installation, metering and scale of tariffs Measurement of Electrical Installations including wiring systems, IEE Regulations.

Project – overall system design with calculations (for both mechanical and electrical services using full scale Engineering/M & E drawings and specifications/symbols)

BLD 411 – Integrated Studio Work/Technical Report Writing

This is essentially a studio work to unify the entire courses offered by the main stream of students. Solutions to set assignments (architectural, structural, services design, preparation of estimates and quantities maintenance surveys materials and structural testing with adequate clarity and against a time frame. It also treats the roles of technical report in building, projects fundamental principles of

technical writing. Format of different types of reports – outlines, scope and purposes, technical discussion and details. Role of appendix, functions of diagrams tables and illustrations, nature of recommendations and conclusions. Writing memoranda, business letter, formal and informal reports.

BLD 501 – Advanced Construction Technology I

The course deals with complex contemporary buildings and specialised topics in construction technology

1. Construction in shallow and deep waters
2. Construction of Tunnels and Railway Tracks, Retaining walls
3. Construction of railway tracks
4. Applications in swimming pools, jetties, harbour works, anchorage, embankment stabilization, retaining wall, construction and coffer dam construction
5. Evaluation of alternative structural forms, performance of structural systems and building envelope
6. Prefabrication: Design techniques (Modular coordination, etc), production techniques (factory, on-site) and assembly techniques (material handling, fixings, fastenings, jointing techniques, etc).
7. Industrialised systems building versus traditional solution
8. Standardisation, quality control and dimensional accuracies in buildings
9. Proprietary system in buildings

BLD 502 – Advanced Construction Technology II

The course deals with specialised topics in construction technology, including industrial processes and engineering services required for effective functions. These are
Mechanical plant and equipment, Large open roof systems (as applicable in large-span roof design and construction e.g. in amphitheatres etc), Piling systems, Dam Construction, Construction of Bridges and Roads, Introduction to Civil Engineering measurements, Case studies on building failures.

BLD 503 – Management of Building Projects

The course deals with building production procedures and practices, which facilitate high productivity on the building site. These include

Technique of project management, Clients, consultants and contractors managerial staff relations, Co-ordination of effort of designers, sub-contractors etc. with the construction process, The role of mechanical plant in construction project management

BLD 504 – Advanced Project Management

The course deals with the practice of project management as a direct service to clients on an in-house or consultancy basis. Analysis of management thoughts, the use of electronic computers in feasibility analysis, design, execution and management of building projects including management technology, financial appraisal and use of scarce resources. Marketing of Construction and Construction products. Construction Risk Management: Quantitative Management and Applications, Resource management and Inventory.

BLD 505 – Professional Practice

The course deals with principles of good practices by professional builders in relation to other sister professions and the interest of clients and the public. Topics include
The NIOB rules of Professional practice, The Registration Board and its regulations, Joint consultative council, SIWES programmes, Partnerships and consortia, design and building constructions, Roles of Professional Builders, Tendering and bidding strategies, Consultancy practices and their regulations.

BLD 506 – Design of Steel Structures

Introduction to steel structures; production and properties of steel and steel systems, Specification of strength and yield stresses of steels; other properties, Basic structural steel sections, traditional hot rolled sections, cased sections, composite sections, steel cables, Corrosion protection of steel structures, Fire protection, Introduction to BS 449 and BS 5950, Structural forms of steel work. Design of basic structural elements i.e. axially loaded members, beams and columns, Simple truss design, Design of connections – bolting, riveting & welding, Rigid and semi-rigid connections, Column connections to foundations, Web buckling, web crushing and lateral torsional buckling, Design of Plate Girders, Design of Industrial Buildings.

BLD 507 – Project Dissertation I

Each student is expected to work on an independent project involving practical and scientific investigations. The report may end at analysis and report stage or extend to a design solution. The course will last a whole session.

BLD 508 – Project Dissertation II

Each student is expected to work on an independent project involving practical and scientific investigations. The report may end at analysis and report stage or extend to a design solution. The course will last a whole session.

BLD 509 – Construction Plant and Equipment

Technical improvements in construction plant and equipment have caused a movement away from manual labour towards mechanisation of construction sites. This course provides adequate information in this topic. Fixed position excavating machines; the bulldozer, scraper, grader, the loader shovel. Special excavating equipment cranes; shear legs and derrick tower cranes; gantry (portal) crane hoist. Fork lift, truck concrete pump etc. Economic comparison of plant alternatives plant profitability and acquisition. Systematic plant selection, calculating plant hire rate. Plant maintenance.

BLD 510 – Productivity Studies on Site

The course is aimed at increasing productivity of building construction by analysing typical methods of construction and production processes:
Work study flow charts – Principles and Techniques, Production targets and incentives, Case Studies

BLD 511 – Highway Engineering

The course deals with the basic elements of highway design and Construction as a primary infrastructures: Planning requirement and layout, Traffic surveys, Road design, construction and maintenance, Highway structures, Low cost roads, footpath and giver ways, Location of services.

BLD 512 – Advanced Building Production/Process

The course is designed to expose the students to advanced system of building by highlighting possibilities now and future for examples: soil strengthening, system of prefabrication, self weathering applied finishes, Jointless flooring.

BLD 513 – Systems Analysis in Construction

System approach to planning; design and operation of large scale physical system: economic and building concepts: linear programming; network and decision analysis; concepts of problem formulation, synthesis and analysis. Applications to building and construction problems.

BLD 514 – Construction Budgeting and Finance

Introduction to form of Business Organisation and Accounting requirement, Accounting Theory, Cost Accounting and Purpose of Accounting, Budgeting, control systems and capital budgeting cost control, Working Capital, Profitability Case Studies.

BLD 515 – Technology and Masonry Design

Introduction to design and technology, Masonry types, stone, bricks, blocks, mortar, materials, properties, reinforcement. Durability of masonry structures. Movement of masonry moistures. Movement and thermal movement. Bonding and workmanship. Calculating structural masonry. Introduction to BS 5628 and CP 111 Empirical method – Building regulation.

BLD 516 – Information System and Management

Definition of information needs use. Communication theory, and sources of information; reliability and interpretation of external information for management purposes; design of management information systems

BLD 517 – Design of Timber Structures

Introduction to structural timber. History of timber houses; beams roof construction, etc. Structural timber today. Properties of timber and wood based materials. Timber preservation and fire retardant treatments. Timber structures manufacturing and assembly procedures. Forms of timber and wood-based materials. Structural forms and design; introduction to CP 112 and BS. Design of solid timber laminated sections, trusses and girders, portal frames and arches. Spatial structures, surface structures. Joints in structural timber; classification of joints, structural jointing by adhesives. Jointing by nails or stapes.

BLD 518 – Design of Highway Structures

Highway standards, design speeds, geometric design for cross sections, grade, alignment, channelisation; inter-sections including grade, rotary and grade separations; highway drainage and open channel designs, culvert designs, bridges, sub-grade, sub-base and pavement design; route location; construction of cuts and embankments, bituminous and concrete pavement design.

BLD 519 – Advanced Structural Analysis

Computer applications of matrix methods of structural analysis, Introduction to finite element methods, Introduction to theory of elasticity, Theory of plates and shells, Buckling of structures.

BLD 520 – Advanced Masonry Design

Isotropic and orthotropic masonry. Rayleigh's method of analysis. Dynamic behaviour of masonry structures; multi-degree of freedom systems. Finite element analysis of masonry structures. Bending, shear and temperature deflection. Design of high rise external and internal walls and cantilevers.

BLD 521 – Fundamentals of Geotechnology

Review of Site Investigation Procedures (to include compaction and location of suitable highway subgrade materials), Design of Shallow foundations to include strips and rafts and special footings (e.g. Beam/Mat on elastic foundation), Deep foundations to include piles (Static and Dynamic analysis), piers and caissons, Retaining Structures (Lateral Earth Pressure, Retaining walls, cantilevered and anchored sheet piles, Braced, Tieback and Slurry walls for excavations, cellular cofferdams), Earth dams, Design of foundations for vibration control.

BLD 523 – Acoustics

Acoustic principles involved in the designs and use of loudspeakers. Microphones, amplifiers, sound level metres, B.F.O's audio spectrometers, tape recorders, pen level recorders, Growth and decay of sound in enclosures, Design of room shape-wave and geometrical acoustics, Speech and music, Sound insulation and absorption, Accoustic models, Noise and the law, Construction to ultrasonic and underwater acoustics, Practical and tutorial work covers, Calibration of a proble microphone, Frequency and directional characteristics of a loudspeaker, Measurement of reverberation time of Oduduwa Hall or Agric Lecture Theatre, Absorption coefficient of materials by (i) standing wave method (ii) reverberation chamber method, Airborne and impact noise insulation of student flat, Investigation of the sound distribution in a room and model of that room Analysis speech and music.

BLD 524 – Advanced Design of Concrete Structures

* Detailed Treatment of Yield line theory: Yield Line theory, Basic Johnansen Theorems Equilibrium and Energy Methods; Isotropic and Orthotropic slabs – Affine and Ultra Affine Method; Strip Method of Design

Design and Detailing of Roof Slabs (Pitched and Folded Plate), Shell (Barrel Vault, Dome), Hyperbolic paraboloid (Normal, Inverted).

Design and Detailing of Compiled Stairs (Cantilever, Jack-knife, open spiral, spins beam with open risers, precast flights to in-situ landings), columns (heavily reinforced, raking struts, spread columns including treatment of Junction details).

Design and Detailing of Tall buildings (Design and Analysis considerations; Planar lateral – load-resisting elements – rigid frames, shear and lift walls, coupled shear walls, shear walls connected to columns, wall frames; interaction between bents; three-dimensional structures – classification and computer modelling, non-planar shear walls, framed tube structures

C.R.P. Laminates and Sandwich Panels

Design of Frameworks – Portal frames; water tower support, H and A frames For precast wall units, Box frames for elevated corridors.

Statically Indeterminate Prestressed concrete structures

Introduction to Bridge Design.

Term Projects – To cover the major divisions of the Syllabus and encourage the use of Computer aided design (CAD).

BLD 525 – LIGHTING

Study of appliances: Incandescent electric lamps, Discharge lamps, Fluorescent lamp, Control gear, Luminance design and construction, Illuminance and luminance calculations for complicated systems and buildings, Practical and tutorial work, Illuminance and luminance measurement, Light output and distribution of electric lamp.

BLD 526 – Advanced Geotechnology

Further principles of site investigation including boreholing or disturbed and undisturbed soil sampling as well as ground water exploitation; tunnelling practice; elastic theories and soil deformation; yield/slip line; limit and equilibrium analysis, plasticity, rheology and critical state in soils.

BLD 527 – Advanced Building Services Design Theory

This subject covers the systematic approach to decision making in building services design. The topics to be covered relate statistical laws and economic laws explicit to the physical laws governing services design. The following topics will be covered:
Introduction to building services design theory, The statistical laws of demand, The economic laws of supply and distribution, Individual building services sub-systems, Total systems.

BLD 528 – Advanced Design of Steel Structures

Plastic, Design of Steel Structures, Composite Construction, Web buckling, web crushing and lateral torsional buckling, Design of Vierendeel girders, Multi-storey steel structures and framing methods, Introduction to design of steel bridges, Tensile structures – stressed skin, suspended cables, arches.

BLD 529 – Thermal Environment

Thermal environment and its measurement. Measurement of Air temperature, air velocity, air humidity and moisture content, radiation, surface temperature. Thermodynamic properties of the environmental fluid. Fundamental properties of air and water vapour mixtures, the gas laws, pure and applied psychrometrics. Ventilation and control of ventilation. Physiological considerations, control of odours and contaminants, control of airborne bacteria and infection, dilution and decay techniques, air distribution. Air filtration. Heating, cooling and ventilation, introduction to systems.

BLD 530 – Advanced Building Acoustics

Propagation of noise outdoors, Transport noise road, rail and aircraft, Impulse noise, Vibration measurement and control, Effect of vibration on man, criteria, Noise in piping and duct system Equipment noise – mechanical and electrical, Practical and tutorial work covers, Road traffic noise survey and analysis, Measurement and analysis of impulse noise, Analysis of machine noise with sound power estimations, Vibration measurements and analysis to investigate the effectiveness of (a) vibration insulation systems (b) damping

BLD 531 – Advanced Building Maintenance Technology I

Planning, financing, executing and supervising maintenance work. Case studies. Measurement and existing of maintenance work.

BLD 532 – Advanced Lighting Design

Specialist application and their varying requirements: Integrated ceiling, Exterior lighting, decorative flood, street, sports, tunnel, Vision and perception, Sunlight and window design Day and electric light integration, Daylight planning and legal requirements, Practical and tutorial work, Sunlight studies, perception studies, Heat generated by lighting, Models to investigate effect of window shape, size and position on day-lighting, Field studies of artificial and daylighting.

BLD 533 – Planning Systems

Relationship of planning to maintenance, Objectives of planning, Components of planning, Schedule/contingency systems, Factors influencing delay time, Programming problems, Long-term programmes, Annual programmes, Short term programmes, Planned inspections, Network analysis.

BLD 534 – Thermodynamics & Heat Transfer

The Second Law of Thermodynamic, Reciprocating machines, Application of First Law to reciprocating machines, Efficiencies utilization of the cooling system etc., Power cycles, Thermal efficiency and work ratio, Carnot vapour and Rankine cycles, superheat, air standard cycles and applications (Emphasis on vapour compression heat pump cycles), Brief introduction of cooling cycles, Heat pump energy ratio. C.O.P. reversed carnot cycles and refrigerants, Entropy calculations, Heat transfer, Convection (qualitative and quantitative) LMTD in heat exchangers, parallel and counterflow modes, introduction to boundary layer for plate and tubes, nusselt and raudtil and rynclde numers for both laminar turbulent flow. Dimensional analysis for forced convection. Radiation (Qualitative and quantitative), Steam-Butzmann Law, Emiasivity, Krchofts Law, Radiation, Exchange factors and factors and heat transfer coefficients, Convective and radiative modes, Pariodio Heat flow (Qualitative and Quantitative), N.T.U. and Newtonian heating and cooling applied to a Building introduction to heat transfer (qualitative only), Hardware, flow patterns, fins, tubes, pins, air/hot water and Steam heat exchange, water/hot water and steam heat exchangers (shell and tube), Energy conservation in Buildings.

BLD 535 – Maintenance of Building Electrical Systems

Basic principles of electric maintenance. Maintenance of electrical Systems in building, estates, factories, and other specialised, Physical structures, Trouble shooting and preventive systems Electrical systems in construction plants, etc..

BLD 536 Integrated Environmental Design

Various advanced aspects of the application of light, heat and sound in building technology, Energy conservation in building, Retrofit, Hubrtid systems, ERE admittance method.

Project: Application of energy conservation strategies in new or retrofitted building.

BLD 537 – Computer Applications in Building

The course deals with the applications of relevant modern software packages in different aspects of Building. The students in also expected to write simple programmes in BASIC FORTRAN, etc to solve simple problems in building.

BLD 538 – advanced Building Maintenance Technology II

Building maintenance problems and their solutions to the following.

Foundations problems waterproof leaking basement paved and grassed areas. Cladding brick-work stone-work, structures frames condensation timber defects, floors, cases, sound insulation thermal insulation, vibration, External finishes grazing. Hot water supply plumbing air conditioning, mechanical fans, Scope of alteration and improvements, moderation of buildings dilapidations.

BLD 540 – Maintenance of Building Mechanical Systems

Basic principles of mechanical maintenance, Maintenance of mechanical systems in the natarors factors, And other specialised physical, Plants and equipment etc.

3.2 Undergraduate Core Curriculum Minimum Academic Standard (CCMAS) Programme

100 Level Harmattan Semester

Course Code	Course Title	Course Unit	Status	LH	PH
GST 111	Communication in English	2	C	15	
MTH 101	Elementary Mathematics I	4	C	45	
PHY 101	General Physics I	4	C	30	
BUD 101	Introduction to Building I	2	C	30	
30%					
OAU-COS 101	Introduction to Computing Science	3	C	30	45
OAU-CHM 101	General Chemistry I	4	C	45	
OAU-PHY 107	General Physics Practical I	1	C		45

OAU-CHM 107	General Chemistry Practical I	1	C		45
Total Unit		21			

100 Level Rain Semester

Course Code	Course Title	Course Unit	Status	LH	PH
GST 112	Nigerian Peoples and Culture	2	C	30	
MTH 102	Elementary Mathematics II	4	C	30	
PHY 102	General Physics II	4	C	15	
BUD 104	Building Graphics, Lettering and Modelling I	2	C		90
BUD 122	Building Construction and Materials I	2	C	15	45
BUD 142	Principles of Economics for Builders	2	C	30	
30%					
OAU-CHM 102	General Chemistry II	4	C	45	
OAU-CHM 108	General Chemistry Practical II	1	C		45
OAU-PHY 108	General Physics Practical II	1	C		45
Total Unit		22			

200 Level Harmattan Semester

Course Code	Course Title	Course Unit	Status	LH	PH
ENT 211	Entrepreneurship and Innovation	2	C	15	45
BUD 211	Mechanics/Strength of Materials (Static) I	2	C	15	45
BUD 221	Building Construction & Materials II	2	C	15	45
BUD 251	Computer Application for Builders	2	C	15	45
BUD 271	Principles of Measurement & Description I	2	C	15	45
BUD 291	Workshop Practice I	2	C		90
30%					
OAU-MTH 201	Mathematical Methods I	2	C	30	
OAU-BUD 205	Building and Environmental Science	2	C	45	
Total Unit		16			

200 Level Rain Semester

Course Code	Course Title	Course Unit	Status	LH	PH
GST 212	Philosophy, Logic, and Human Existence	2	C	30	
BLD 222	Building Construction and Materials III	3	C	30	45
BUD 272	Principles of Measurement and Description II	2	C	15	45
BUD 292	Workshop Practice II	2	C		90
30%					
OAU-MTH 202	Elementary Differential Equations	2	C	30	
OAU-BUD 212	Mechanics/Strength of Materials II (Dynamics)	2	C	15	45
OAU-BUD 282	Soil Mechanics and Foundation I	2	C	15	45
Total Unit		15			

300 Level Harmattan Semester

Course Code	Course Title	Course Unit	Status	LH	PH
BUD 321	Construction Technology I	2	C	15	45
BUD 331	Building Maintenance I	2	C	15	45
BUD 341	Building Services and Equipment Installation I	2	C	15	45
BUD 371	Principles of Construction Management	2	C	30	
30%					
OAU-BUD 391	Research Methods	2	C	30	
OAU-BUD 311	Structural Analysis	2	C	30	
OAU-BUD 381	Soil Mechanics and Foundations II	2	C	15	45
OAU-BUD 333	Building Thermodynamics	2	C	15	45
Total Unit		16			

300 Level Rain Semester

Course Code	Course Title	Course Unit	Status	LH	PH

ENT 312	Venture Creation	2	C	15	45
GST 312	Peace and Conflict Resolution	2	C	30	
BUD 312	Reinforced Concrete Design I	2	C	15	45
BUD 322	Construction Technology II	2	C	15	45
BUD 332	Building Maintenance	2	C	15	45
BUD 342	Building Services and Equipment Installation II	2	C	15	45
BUD 376	Construction Planning, Methodology and Programming for Builders	2	C	15	45
30%					
OAU-BUD 362	Health & Safety Management in Construction	2	C	15	45
Total Unit		16			

400 Level Harmattan Semester

Course Code	Course Title	Course Unit	Status	LH	PH
BUD 411	Reinforced Concrete Design II	2	C	15	45
BUD 413	Integrated Studio Work	2	C		90
BUD 431	Construction Plant and Equipment	2	C	15	45
BUD 451	Quality Management for Building	2	C	15	45
BUD 471	Building Economics and Cost Planning	2	C	30	
BUD 481	Concrete Technology for Building and Infrastructure Work	2	C	15	45
BUD 491	Operation Research	2	C	30	
30%					
OAU-BUD 441	Buildability & Maintainability Analysis	2	C	15	45
Total Unit		16			

400 Level Rain Semester

Course Code	Course Title	Course Unit	Status	LH	PH

BUD 402	Student Industrial Work Experience Scheme III	6	C	24 weeks
30%				
OAU-BUD 200	Student Industrial Work Experience Scheme I	4	C	9 weeks
OAU-BUD 300	Student Industrial Work Experience Scheme II	5	C	12 weeks
Total Unit		15		

500 Level Harmattan Semester

Course Code	Course Title	Course Unit	Status	LH	PH
BUD 521	Advanced Construction Technology I	2	C	15	45
BUD 571	Project Management I	2	C	30	
BUD 591	Project Report I	3	C		
BUD 593	Building Information Modelling & Robotics I	2	C	15	45
30%					
OAU-BUD 541	Professional Practice and Ethics	2	C	30	
OAU-BUD 531	Construction Budgeting and Finance	2	C	45	
OAU-BUD 525	Building Production Management	2	C	45	
Minimum of Two (2) restricted electives					
Total Unit		19			

RESTRICTED ELECTIVES (Students are required to select a minimum of Two (2) electives based on their area of specialization)

Course Code	Course Title	Course Unit	Status	LH	PH
BUILDING STRUCTURES					
BUD 593	Highway Engineering	2	E		
BUD 595	Design of Timber Structures	2	E		

BUD 597	Advanced Structural Analysis	2	E		
CONSTRUCTION MANAGEMENT					
BUD 599	Principles of Construction Leadership	2	E		
BUD 533	Leadership Theory	2	E		
BUD 535	Artificial Intelligence in Construction	2	E		
BUILDING SERVICES					
BUD 537	Acoustics	2	E		
BUD 539	Lighting	2	E		
BUILDING MAINTENANCE					
BUD 541	Advanced Building Maintenance Technology I	2	E		
BUD 543	Maintenance of Building Electrical Systems	2	E		

500 Level Rain Semester

Course Code	Course Title	Course Unit	Status	LH	PH
BUD 512	Design of Steel Structures	2	C	15	45
BUD 522	Advanced Construction Technology II	2	C	15	45
BUD 552	Contract Administration	2	C	30	
BUD 572	Project Management II	2	C	30	
BUD 592	Project Report II	3	C		
BUD 594	Building Information Modelling & Robotics II	2	C	15	45
30%					
OAU-BUD 561	Facilities Management	2	C	45	
Minimum of Two (2) restricted electives					
Total Unit		19			

RESTRICTED ELECTIVES (Students are required to select a minimum of Two (2) electives based on their area of specialization)

Course Code	Course Title	Course Unit	Status	LH	PH

BUILDING STRUCTURES					
BUD 594	Masonry Design	2	E		
BUD 596	Advanced Design of Concrete Structures	2	E		
CONSTRUCTION MANAGEMENT					
BUD 598	Sustainable Construction System	2	E		
BUD 524	Construction Informatics and Data Analytics	2	E		
BUILDING SERVICES					
BUD 526	Advanced Building Services Design Theory	2	E		
BUD 528	Thermal Environment	2	E		
BUD 530	Advanced Building Acoustics	2	E		
BUD 532	Advanced Lighting Design	2	E		
BUD 534	Thermodynamics and Heat Transfer	2	E		
BUILDING MAINTENANCE					
BUD 536	Advanced Building Maintenance Technology II	2	E		
BUD 538	Maintenance of Building Mechanical Systems	2	E		

Course Contents

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Sound patterns in English Language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). English Sentences (types: structural and functional, simple and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and Critical Thinking and Reasoning Methods (Logic and Syllogism, Inductive and Deductive Argument and Reasoning Methods, Analogy, Generalisation and Explanations). Ethical considerations, Copyright Rules and Infringements. Writing Activities: (Pre-writing, writing, post writing, editing and proofreading; Brainstorming, outlining, paragraphing, types of writing, Summary, Essays, Letter, Curriculum Vitae, Report writing, Note making. Mechanics of writing). Comprehension Strategies: (Reading and types of reading, Comprehension Skills, 3RsQ). Information and Communication Technology in modern Language Learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian Peoples and Culture (2 Units C: LH 30)

Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and selfreliance). Social justices and national development (law definition and classification. Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation; Re-orientation Strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Course Contents Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

COS 101: Introduction to Computing Sciences (3 Units C: LH 30; PH 45)

Brief history of computing. Description of the basic components of a computer/computing device. Input/ Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

Lab Work: Practical demonstration of the basic parts of a computer. Illustration of different operating systems of different computing devices including desktops, laptops, tablets, smart boards and smart phones. Demonstration of commonly used applications such as word processors, spreadsheets, presentation software and graphics. Illustration of input and output devices including printers, scanners, projectors and smartboards. Practical demonstration of the Internet and its various applications. Illustration of browsers and search engines. How to access online resources.

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Space and time; units and dimension, vectors and scalars, differentiation of vectors: displacement, velocity and acceleration; kinematics; Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation); Relative motion; Application of Newtonian mechanics; Equations of motion; Conservation principles in physics, conservative forces, conservation of linear momentum, Kinetic energy and work, Potential energy, System of particles, Centre of mass; Rotational motion; Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates; conservation of angular momentum; Circular motion; Moments of inertia, gyroscopes and precession; Gravitation: Newton's Law of Gravitation, Kepler's Laws of Planetary Motion, Gravitational Potential Energy, Escape velocity, satellites motion and orbits.

PHY 102: General Physics II (2 Units C: LH 30)

Course Contents Heat, temperature and temperature scales. Gas laws; general gas equation, thermal conductivity. First Law of thermodynamics, heat, work and internal energy. Reversibility, second law of thermodynamics, heat engines and entropy. Zero's law of thermodynamics, kinetic theory of gases, molecular collisions and mean free path. Elasticity, Hooke's law, Young's, shear and bulk moduli. Hydrostatics, pressure, buoyancy, Archimedes' principles. Bernoulli's equation and incompressible fluid flow. Surface tension, adhesion, cohesion, viscosity, capillarity, drops and bubbles.

CHM 101: General Chemistry I (3 Units C: LH 45)

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces; Structure of solids. Chemical equations and stoichiometry; Chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

BUD 101: Introduction to Building I (2 Units C: LH 30)

Overview of the building construction process and the building industry. The role of different stakeholders in the construction industry. Building as a structure, a process and a discipline. The history of building, its function and types; origin and growth of settlements, factors affecting settlements and its development, statutory and local authority requirement. Introduction to building profession and other related professions in the built environment such as Land Surveying and Geo-informatics, Urban and Regional Planning, Architecture, Quantity surveying, Estate Management, Civil, Mechanical and Electrical Engineering. Scope of duties, future prospects and roles of professionals in the construction industry.

BUD 104: Building Graphics, Lettering and Modelling I (2 Units C: PH 90)

An introduction to and interpretation of architectural, civil, structural, and electrical drawings. Application of freehand sketches in graphic communication in building for construction details and sections, manual construction drafting, scaling, lettering, presentation and working drawings, standard scaling, development of simple surfaces, plotting loci, modelling, ellipse and other geometrical figures.

BUD 122: Building Construction and Materials I (2 Units C: LH 30)

Statutory and Local Authority requirements. Site preparation: Clearing of bushes, grubbing up roots, top vegetable soil excavation, reduced soil excavation, reduced level excavation, dewatering,

extermination of termite nests. Types of engineering soils: Importance of soil investigation. Sequence of building operations. Setting out of a simple building, using builders square, 3-4-5 Method, and checking the accuracy of setting out. Classification and properties of building materials, survey of current types of materials and methods used in building construction, concrete (cement, aggregate, water), timber, plastic and steel framing systems; masonry construction; interior and exterior finishes. Students are introduced to preliminary and basic construction processes in the construction of buildings. Types of foundation (strip, pile, pad and raft), functional requirements of foundations, trenching excavation and support, types and functional requirements of floors such as solid ground floor and raised timber ground floors.

BUD 142: Principles of Economics for Builders (2 Units C: LH 30)

An introduction to economics, its scope methodology and relationship to the building/construction industry. Supply and demand considerations, elasticity, GDP, the Nigerian financial system, money and banking regulations. General principles of economics (micro/macroeconomics). The basic problems of resource allocation and modes of production (building components). Factors of production and law of diminishing returns, methods of production, market structures (perfect competition, monopoly, and oligopoly), structure of the Nigerian economy (real sector, service sector), marketing and sales management, and Pricing methods (demand and supply, tendering procedures).

POSTGRADUATE PROGRAMME

1.0 Requirements for Higher Degrees

M.Sc. Degree: Every candidate for the M.Sc. degree shall pursue a full-time course of study for a period of not less than four semesters. Candidates are required to successfully complete a minimum of 20 course units and also present a dissertation which must be an original research work. An Oral examination will be arranged for candidates who present their dissertation.

M.Phil. Degree: The Department offers the advanced research Masters' degree by course work, written examination and research thesis which leads to the M.Phil. degree. Every candidate for the M.Phil. degree must pursue a full-time course of study and research in the Department for a period of not less than four semesters. The course work requires a minimum of 28 units. In addition, candidates must present a research thesis which will be orally examined.

Ph.D. Degree: The duration of the Ph.D. programme will be a minimum of six semesters after the M.Sc./M.Phil. A total of 12 course units is compulsory for all candidates proceeding to the Ph.D programme in the Department of Building. In addition, each candidate will be required to carry out an original research and present an acceptable thesis on a topic previously approved. Furthermore, candidates will be expected to pass an oral examination. All candidates for the Ph.D. degree shall pass a qualifying examination before allowed to proceed to the final stage of their research work.

2.0. Admission Requirements

Candidates must satisfy the general regulations governing graduate studies at the Obafemi Awolowo University of Ife as contained in the Post-graduate School Handbook. They must also satisfy the general requirements for undergraduate admissions in the Department of Building.

Requirements for the M.Sc. Degree: Candidates for the M.Sc. programme must have at least a Second Class Honours degree of Obafemi Awolowo University (or its equivalent) in one of the following: Building/Building Technology, Civil Engineering, or Quantity Surveying. For the Building Services and Energy Management programme, graduates in Mechanical Engineering will be eligible. Also for Building Structures, only graduates in Building and Civil Engineering are eligible. Applicants must have a minimum of two years post degree experience.

Requirement for the M.Phil. Degree: Applicant for admission shall be a graduate of the Obafemi Awolowo University (or its equivalent) with at least a second Class (Upper Division) Honours degree in Building, Civil Engineering, Quantity Surveying, Building Service Engineering, or Mechanical Engineering. A candidate who holds an M.Sc. But scored less than B+ average in his/her M.Sc. degree programme may be admitted for the M.Phil.

Requirements for the Ph.D. Degree: Candidates for the Ph.D. must have M.Sc. or M.Phil. in an area related to their proposed course. A candidate registered for the degree of Master of Philosophy (M.Phil.) programme for not less than two semesters and who in the coursework, has shown exceptional ability may be transferred to candidature for Ph.D subject to Regulation 21 of the postgraduate school.

3.0 Programmes

(i) Building Structures.
(ii) Building Services.
(iii) Building Maintenance.
(iv) Construction Management.

4.0 List of Courses

Candidates for the M.Sc./M.Phil. Programme must take all the compulsory courses and also select some courses from the electives where applicable. Candidates for the Ph.D. programme are permitted to select their courses from any of the elective courses not previously taken for their Masters programme. The courses offered in the Department are as follows:

Construction Management and Building Maintenance Management Compulsory Courses:

Harmattan Semester

Course Code	*Course Title*	*Unit*
BLD 601	Advanced Management in Construction	3
BLD 602	Design and Construction Methodology	3
BLD 603	Building Economy and Industrial Organization	3
QTS 601	Construction Logistic and Estimating	3
CSC 621	Advanced Operation Research	3

Rain Semester
Any two courses from the following:

Construction Management

Course Code	*Course Title*	*Unit*
BLD 604	Building Project Finance	3
BLD 605	Construction Plant and Equipment	3
BLD 606	Work Study Applied to Building	3
BLD 607	Advanced Management Studies	3
QTS 604	Applied Building Contracts	3
MBA 652	Management Information Systems	2

Maintenance Management

Course Code	*Course Title*	*Units*
BLD 611	Building Maintenance Technology	3
BLD 612	Principle and Practice of Maintenance	3
BLD 613	Building Codes and Regulations	3
QTS 604	Applied Building Contracts	3
CSC 621	Advanced Operation Research	3
MBA652	Management Information Systems	2

Building Structures Courses

Harmattan Semester

Compulsory Courses

Course Code	*Course Title*	*Units*
BLD 615	Building Material and Structure	3
BLD 616	Theory of Structures	3
BLD 617	Structural Stability	3
BLD 618	Strength of Materials	3
CSC 621	Advanced Operations Research	3
BLD 636	Elasticity	3

Rain Semester

Any two Courses from the following

Course Code	*Course Title*	*Units*
BLD 619	Advanced Structural Analysis	3
BLD 620	Advanced Design of Timber Structures	3
BLD 621	Advanced Design Reinforced concrete Structures	3
BLD 622	Advanced Design of Steel Structures	3
BLD 623	Concrete Practice	3
BLD 634	Finite Element Analysis	3

BLD 635	Structural Dynamics	3

Building Services Courses

Harmattan Semester

Course Code	*Course Title*	*Units*
BLD 625	Thermodynamics and Aerodynamic of Buildings	3
BLD 626	Building Services Design Theory	3
BLD 627	Climate and Thermal Comfort	3
BLD628	Introduction of Energy Management	3
CSC621	Advanced Operation Research	3

Rain Semester

Any two Courses from the following

Course Code	*Course Title*	*Units*
BLD 629	Ventilation and Air-conditioning	2
BLD 630	Advanced Vibration and Noise Control	2
BLD 631	Lighting and Electrical Service	2
BLD 632	Energy Conservation Methodologies	2
BLD 633	Energy Accounting	3

5.0 Examination Scheme and Dissertation

M.Sc./M.Phil. Degree: All candidates must sit and pass written examination on any course offered in each semester in addition each candidate must submit a dissertation on approved topic. Candidates must present themselves for oral examination.

Ph.D. Degree: Examination in the prescribed course (where applicable) shall be my means of not less than a three-hour written paper in each course. Candidates must also pass a qualifying examination before being allowed to continue with the programme (see section 27 of the pot-graduate Handbook) Each candidate is required to submit a thesis on an approved topic. An oral examination will be arranged for the thesis.

6.0 Course Description

BLD 601 Advanced Management in Construction

This course introduces the student to the theory of Management and Business management in general, information Retrival and Management, Management objectives and office procedures, Production Methods and Control, Financial accounting and control of funds, Building Contracts and procedures tendering and bidding, forecasting and Planning the use of statistical concepts of probability. It also covers areas of Plant Management and Construction equipment cost analysis Personnel management.

Industrial Relation both at site and office administration, building management and influence of economic factors and communication within the construction industry.

BLD 602. Design and Construction Methodologies

The objective of this course is to provide adequate knowledge on the theory and practice of design and construction of buildings. Design methods and production processes. Production Methods and Processes on the Building sites. The influence of large unskilled labour on design and Construction Methodologies Reshaping the value judgement of design and production terms in the construction industry.

BLD 603. Building Economy and Industrial Organization

The importance of economics in construction management is covered in this course Business Objective: the allocation of resources market mechanism Demand theory indifference analysis, supply, Production function costs Models of market behaviour, monopoly competition discrimination monopoly, imperfect competition behavioural theories factor markets the remuneration of factors of production definition and measurement of National income. The circular flow of income consumption saving investment. Fluctuations in general and building activity. The role of money, interest rates, inflation, International trade government economic policy; government intervention location of fabrication and assembly transport costs scale of economic activity comparison between construction and other industries integrated diversification mergers; legislation restrictive practices experience in construction industry. The structure of and communication within the construction industry, implication for cost quality and growth of output.

BLD 604 Building Projects Finance

Introduction to financial accounting. Examination and analysis of source of funds for financial working capital and other real estate transactions. Investment Analysis with particular reference to construction projects. Management serving and repayment of loans; methods of loan renegotiations and rescheduling. Policy and decision-making as it relates to financial management Example – hiring /buying/leasing plant and equipment making and buying building material and products: urban Development Financial etc.

BLD 605 Construction Plan and Equipment

The importance of construction equipment in the production of buildings, Typical construction, equipment, Classifications, Performance and their relative cost advantage. Plant and Equipment – Management selection brands mode of acquisition and use, operation maintenance and safety measures. The annual cost depreciation replacement and scraping of construction equipment. Influence of tax buying of new equipment the development of appropriate basic equipment for the development countries.

BLD 606. Work Study Applied to Building

Introduction to Workers Preference and Productivity Studies, Time Study-Principle Procedures and Applications. Work measurement Principles Procedures and Application. The use of activity sampling on the Building Sites-Practical ap[placations, difficulties and prospects job evaluation and value engineering investigation of alternatives financial and non-financial incentives workers attitudes.

BLD 607 Advanced Management Studies

Manpower management Industrial relations as a fact of management Main areas in industrial relation Negotiation of incomes and conditions of employment agreements Procedures for avoiding disputes. Joint consultative arrangements. M Fringe benefits – state private and collective. Negotiation procedures. The role of the government in industrial relations Conciliation and arbitration in the prevention and settlement of trade disputes. Dismissals procedures selection or redundancy procedures statutory tribunals for safeguarding rights of individual recognition of trade unions organization and manpower delegation recruitment and selection Marketing research the purpose and scope and of marketing research. The major variables. Types of study Advertising research. Readership surveys, impact measurement sales forecasting simple regression analysis multiple factor analysis

BLD 611: Building Maintenance Technology

Forms of changes in building Decay changes in appearance, weather foreign attacks, etc, the mechanisms and processes of the changes. Methods for maintaining physical stability influence of environmental factors construction detailing as tool against premature failures; tolerance and standards Performance testing and durability prediction case studies on service performance of buildings Qualitative Studies Maintenance as an extension of design methods

BLD 612 Principles and Practices of Maintenance

Analysis of Maintenance works in selected organizations Structure of the maintenance, Direct Labour and building maintenance Direct labour and building maintenance Contract Maintenance Economics and control systems supervision of operations Professional standards to management of residential commercial and industrial properties leasing and tenancy terms Structure survey practices. The management of public properties.

BLD 613 Building Codes and Regulations

A review of codes and regulation from planning control and application view points
National codes States Codes Local Codes and other regulating agencies of relevance to the construction industry. Special studies in fire health safety, materials specification etc standards and the practically of some known standards

BLD 615 Building Materials and Structures

The structure and use of currently applied building materials. The functional adequacy of existing methods. Application of existing materials including local ones to new situation. Advanced Construction Techniques. Appropriate production techniques for manufacturing building materials locally, Practises and Procedures in the use of other Building materials. The use of new materials for structural purposes Specifications.

BLD 616: Theory of Structure

Elastic analysis of plane and space, frames, elastic instability of members and frames. Plastic analysis of plane and space frames incremental collapse, alternating plasticity and shakedown, influence of axial loads and instability on plastic collapse loads, failure loads deflection of members after yielding begins, natural frequencies of vibration, dynamic response to impulsive loads: fatigue; approximate methods of analysis.

BLD 617 Structural Stability

Buckling of columns for various loading conditions. Stable and unstable equilibrium. Bucklings load of tapered columns. Elastic stability of framed structures. Lateral and torsional stability of beams and beam-columns. Beams on elastic foundation. Inelastic stability of columns. Bending and buckling of plates and shells.

BLD 618 Strength of Materials

Two and three dimensional problems in theory of elasticity in plates shells and bars under various loading conditions: propagation of waves in elastic media; finite element methods torsion Fracture mechanics of structural materials and appropriate usages; non-destructive testing in – situ testing creep and deflection in concrete crack with perdition.

BLD 619: Advanced Structural Analysis

Analysis of statistically indeterminate frames and arches by the slope-deflection, moment distribution, including Kani"s method, area-moment and column analogy methods. Influence lines method for continuous beams and frames. Force and displacement methods of matrix structural analysis applications to beams, frames, grids, etc.

BLD 620: Advanced Design of Timber Structures

Properties of wood. Stress-strain relationship in anisotropic materials. Design of wood frames arches and shells. Glue laminated timber structures.

BLD 621: Advanced Design of Reinforced Concrete Structures

Advanced topics in reinforced concrete design using ultimate strength Deflections and shear strength calculations under different loading conditions of beams, beam – columns, slabs etc. Compression members. Two way slab, flat Torsion Composite construction. Introduction to prestressed concrete, Special problems in design

BLD 622. Advanced Design of Steel Structures

Compression members Designs of columns and effect of shear. Bending of unsymmetrical sections, Design for torsion and backing. Thin web plate girders. Beam- Column, Steel frame Design and the unstiffened light gauge steel elements. Effect of fatigues Standardisation in designs.

BLD 623 Concrete Practice

Quality control of concrete in its various applications. The design of concrete mixes to produce. The Laboratory efforts for large-scale production Field operations and laboratory testing of samples models and full size structural members precast concrete and prestressed concrete practice. Effect and failure in concrete works and products including remedies. Fire effects on concrete.

BLD 625 Thermodynamics and Aerodynamics of Buildings

This course deals with modes of heat transfer and effects of wind on buildings.
Thermal: Dynamics and steady state heat flow, units of measurements, thermal characteristics of various building materials

Wind Effect: The action of wind on pressure pattern around buildings design methodology, field measurements.

BLD 626: Building Services Design Theory

This course will deal with the fundamental concepts which give rise to better design of engineering services in buildings.
Flows system; complementary system; sizing of systems, control of systems; services as building sub-systems; total systems.

BLD 627: Climate and Thermal Comfort

The sun; electronic wave spectrum Terrestrial solar energy interception rate of energy usage; annual variation in local solar intensities; external design condition for dry, wet and Harmattan Seasons; microclimate; large scale weather modification.
Assessment of thermal comfort; various parameters affecting thermal comfort. ASHRAE comfort charts.

BLD 628: Introduction to Energy Management

Managing energy. Principles of energy conservation. Role of the energy manager. Energy auditing and costing. Control and planning. Energy measurement. Primary fuels – classification, delivery, storage and handling. Sources of loss and loss control. Steam and hot water production. Component costs and their control. Boiler efficiency. Steam distribution and use. Chimneys and waste gas handling: Industrial space cooling – system, air changes, buildings insulation controls, heat recovery. Furnances – heat losses, heat recovery. Drying processes. Electricity tariffs and cost control. Load factor, Power factor. Compressed air. Water. Lubrication and 'waste' oil Transport fleet operations and equipment.

BLD 629: Ventilation and Airconditioning

Ventilation systems types of fans and air filter fan duty and characteristics. Fundamental properties of air and water vapour mixtures, psycholotry or air conditioning process. Heat gain from solar and other sources. Cooling load. Vapour compression refrigeration, cooler coils and air washers. Refrigeration plant: automatic controls, Airflow in ducts. High velocity systems. Computer aided design.

BLD 630: Advanced Vibration and Noise Control

Improving room acoustics. Sound Insulation. Motorway noise and dwellings. Vibration in buildings. Theory and Practice of acoustics design. Measurement of sound.

BLD 631: Lighting and Electricity

Theory of light propagation. Estimating daylight in buildings. Calculation of illuminance and luminance in interiors. Heat from lighting, Design of lighting system on Buildings. Overhead and underground distribution systems. General layout of distribution systems and wiring installations. Distribution substations (transformer stations). The basic scheme of interconnected low voltage distribution systems (operating voltages). Three-phase, four wire connection. Typical rural distribution systems. Voltage control in distribution networks. Network calculations on distribution. Earthing in transmission lines low voltage distribution systems, industrial and domestic installations. Domestic Control units. Relative economy of distribution methods. Organization of Power supply. Regulations on installation and operation of electrical equipment. Method of charging for electrical supply.

BLD 632: Energy Conservation Methodologies

Fuel prices and conversion. Efficiencies. Reduction of energy consumption. Optimising building design for energy self-sufficiency Low-cost energy saving methods. Reduction of room temperatures. Draughtproof. Application of thermal insulation, conductive, convective and radiative insulators. Mass transfer insulators. Thermal insulants. Cavity walls. Double-gazing Effects of applying low-cost energy-saving methods to buildings. Thermal design.

BLD 633: Energy Accounting

Introduction. Measurement of resources. Building resource allocation model. Life cycle costing. Life-cycle costing using market prices. Life-cycle costing using prime energy accounting Energy analysis. Life-cycle costing using energy analysis.

BLD 634: Finite Element Analysis

Basic concepts of finite element technique. Application of finite element method to elastic problems in plane stress and plain strain. Plate bending; shell analysis, structural stability and non-linear problems. Survey of numerical methods applied to finite element method. Finite element software, equation solvers, eigen-value routines and schemes for direct integration. Band and front minimizer, substructuring.

BLD 635 Structural Dynamics

Behaviour of one-degree and multi-degree systems under free and forced vibration. Normal frequencies and modes of vibration. Analytical and numerical methods of analysing the response of structures – Viano-Stadola, Rayleigh-Ritz and methods of obtaining eigen-values and eigenvectors of normal vibration. Langrange equation. Model analysis of multidegree systems. Static analysis of the earthquake problem. Dynamic seismic analysis. Concepts and techniques of seismic design.

BLD 636 Elasticity

Stress – Strain analysis. Field equations and boundary value problems. Variational method of the theory of elasticity – Bending, buckling and torsion. Complex variable methods. Three dimensional problems. Elastic waves. Vibrations. Introduction to plasticity. Stress spaces, loading path yield surface. Various deformations and incremental theories. Boundary value problems of plasticity.