Bachelor of Technical Education (B Tech Ed)

(Information Technology)

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Bachelor of Technical Education (B. Tech. Ed.) Program: Program Context

Technical and Vocational Education and Training (TVET) has been one of the prominent sectors globally for a long. Dewey (1916) saw TVET as a tool for education reform in modernizing society. This has been equally vibrant in the present context as scholars (e.g. Maclean & Wilson, 2009) argue that TVET is an education and training that prepares an individual for gainful employment. TVET programs equip young people with the skills, knowledge, and competencies required to enter a particular type of professional career (OECD 2017). Hence, the role of TVET in preparing skilled human resources and enabling them to transition into the career path for gainful employment in specific and the country's economic development in a broad is inevitable.

Background

The formal TVET began in Nepal only around mid of the 20th century. Nevertheless, occupational skills have been transformed from generation to generation for a long (Ministry of Education [MoE], 2012). The establishment of the Council for Technical Education and Vocational Training (CTEVT), the governing body of TVET in 1989, was a substantive effort toward its development and expansion (CTEVT, 2019). Additionally, at present, the Centre for Education and Human Resource Development (CEHRD) offering technical diplomas in 284 technical stream schools throughout the country (GoN, 2018) and universities (such as Kathmandu University, Manmohan Technical University, etc.) run bachelor and master in TVET and other 11 federal ministries offer TVET related formal and non-formal programs (MoEST, 2019).

The CTEVT, which is in charge of formulating TVET-relevant policies, developing standards for programs and curriculums, coordination, accreditation, monitoring, and supervision (CTEVT, 2019) largely shares the TVET related activities. There are 1131 CTEVT affiliated and constituent institutions with roughly the average capacity of 70,000 per annual operate formal TVET programs (CTEVT, 2020). Further expansion of TVET institutions in the country is yet to be expected soon since the government has a provision of establishing at least one technical school in all local levels.

The Gap

The existing human resource related to TVET is insufficient. For example, there are 932 permanent employees in CTEVT to manage, implement, and regulate 31 programs in about 1500 constituent and affiliated Polytechnics (technical schools), community schools, and private institutions across the country (CTEVT, 2019). Of course, this figure of institutions will surge shortly with mushrooming TVET schools as the establishment has begun from provincial and local governments, especially after the federal restructure. The CTEVT constituent Polytechnics have only a few permanent instructors, while most other required are hired on a temporary and contract basis. Community schools running CEHRD technical programs are provisioned for 2 to 4 teachers; however, a permanent teacher has not been recruited. This shows most of the instructors in the technical schools are hired as per the needs and such instructors are very less or without pedagogical knowledge on the respective subject as the instructors are from a technical background such as engineering, agriculture, technology, etc that do not necessarily cover the pedagogical aspect. This scarcity of teachers in technical schools of Nepal is also anticipated in School Sector Development Programme (SSDP) (2016), which aimed at preparing 998 specialized teachers by 2021 in the technical subjects. Insufficient of specialized teachers in technical schools yet to be seen in the days to come with the government's current policy of establishment of at least one TVET school at all local levels and increasing share of students' enrolment from about 15% of the present situation to 70% of total student in secondary level education (MOEST, 2019).

The education policy (2019) envisions access to TVET education for all. However, this is only possible when competent and specialized teachers are available for different technical programs in Nepal. The existing human resource shows technical schools have a severe lack of specialized teachers. There needs immediate action for preparing competent teachers to enhance the quality of technical education in all governments.

Bachelor of Technical Education (BTechEd) of Kathmandu University is the only program that prepares teachers in technical and vocational education and training in Nepal. B Tech Ed is a pioneer bachelor program and implemented by Technical Institute for Technical Instructors (TITI). The program aims at preparing instructors, teachers, or trainers in technical subjects (TITI, 2021). The expansion of the B Tech Ed program will be a milestone if it fulfils teachers' demands in

technical schools, which has been a profound lack with a constant increase in the TVET institutions/programs.

The TVET programs are primarily in the secondary level education, and an instructor is required to have a minimum bachelor degree educational qualification. BTech, one of the innovative programs started realizing the need for technical human resources in Nepal to meet such requirements. The Program equips a student with a different technical background with classroom instruction or pedagogical aspects in their specialized subjects. The Program is run by TITI with the expectation that it would fulfill the need of the technical schools across the country. However, at the existing pace, fulfilling the requirement would be almost impossible since every year roughly 10 students are graduated from the Program. Nonetheless, this program would be supportive to the local government and provincial governments if the program is expanded and more students are graduated. In this regard, its immediate expansion is necessary for the decentralized context. For this, the collaboration with relevant stakeholders, in all level of governments need to be established so that it will on the one hand support preparing good instructors, on the other hand, sustain the TVET programs with the engagement of quality teachers.

In the federal context, it would be rational to run the Program in a decentralized manner. Running a TVET program is costly, in this sense, it might be difficult to generate resources for huge investments across the country. In this respect, the university can collaborate with the relevant stakeholders such as polytechnic, private sectors, etc. preparing the teachers which may have already well-functioning labs and infrastructure in all provinces or even in the local governments. It would be also an opportunity for the university to fulfill the demand that it can develop its lab according to trade-specific occupation and that would be a contribution to preparing competent teachers/instructors in a decentralized context.

The Bachelor of Technical Education (B. Tech. Ed.) Program

The purpose of the Bachelor of Technical Education (B. Tech. Ed.) is to prepare individuals for careers in the private and public sector at the level of instructor, teacher, trainer, or professionals in technical and vocational education subject areas.
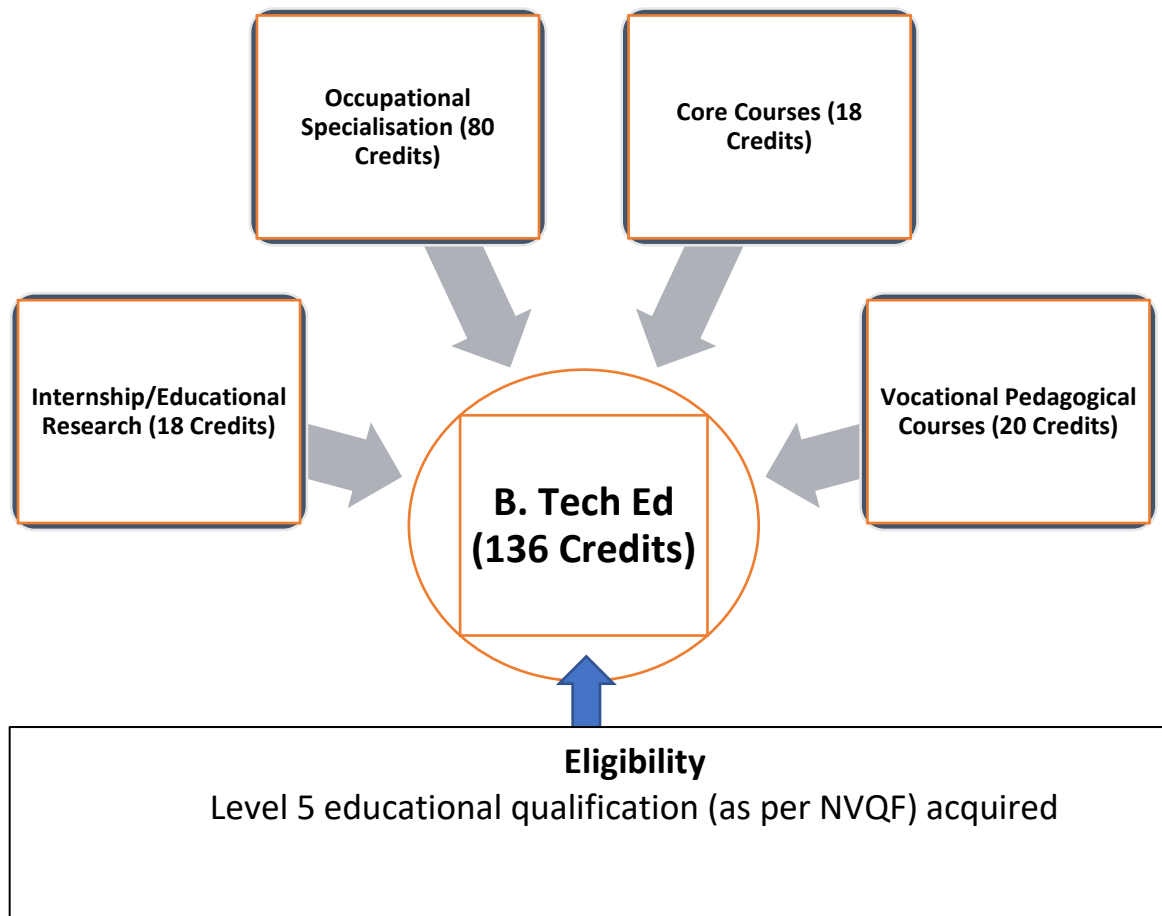
The following are the aims of the program:

1. Demonstrate Level 6 competencies envisaged by the National Vocational Qualification Framework (NVQF) of Nepal,
2. Exhibit comprehensive, meaningful, and coherent knowledge and skills in any of the specific fields in technical-vocational occupational specialization e.g., civil, mechanical, computer, agriculture, etc,
3. Apply occupational specialization knowledge and skills in solving problems occurred in their contexts of work,
4. Apply vocational pedagogical knowledge and skills in any of the specific fields in technical and vocational instruction,
5. Show scholarly literacy, communication, quantitative reasoning, critical thinking, learning skills needed for advanced learning,
6. Exemplify a deep and principled understanding of the technical and vocational learning processes and the role of the instructors in facilitating these processes in the students,
7. Show a sound understanding of how educational processes relate to larger historical, social, cultural, and political processes,
8. Apply a wide range of teaching process skills including curriculum development, lesson planning, materials development, assessment, and pedagogical approaches, and
9. Reflect on the relationship between teaching and learning, content and pedagogy, work and learning, thereby embracing lifelong learning in their roles as the technical and vocational instructors

The Program has been divided into eight semesters. The total credit hours of the Program are 136. At the end of each semester, there will be a semester assessment. However, according to Kathmandu University rule, the total duration to complete the Program must not exceed seven years.

Normally, graduates of the B Tech Ed Program are eligible for master-level studies (equivalent to Level 7) in technical and vocational education, teacher education, general management, technology management, educational leadership, TVET management, rural technology, to name but a few.

Bachelor of Technical Education
Program Structure

Occupational Specialisation (80 Credits)

Core Courses (18 Credits)

Internship/Educational Research (18 Credits)

B. Tech Ed (136 Credits)

Vocational Pedagogical Courses (20 Credits)

Eligibility
Level 5 educational qualification (as per NVQF) acquired

Entry Requirements

The minimum prerequisite for this program is the completion of Level 5 education in relevant vocational specializations. The details are-

- PCL equivalent diploma or an intermediate in a technical subject ($\geq$ 2nd division) from a recognized institute with SLC ($\geq$ 2nd division); or
- A two-year technician certificate ($\geq$ 50%) from a recognized institute with SLC ($\geq$ 2nd division); or
- An intermediate level in a technical subject ($\geq$ 2nd division) from a recognized institute with TSLC ($\geq$ 50%);
- A 2-year technician certificate from a recognized institute ($\geq$ 50%) with TSLC ($\geq$ 50%); or
- 10+2 or equivalent (SLCE after 2016) with sufficient background/experience for the area of vocational specialization.

General Educational Knowledge test (oral and written): This is a written objective test to assess the applicant's knowledge in Mathematics, Science, and English corresponding to intermediate/10+2/diploma levels. Those who secure 50% can be eligible for the study.

Oral/Occupational assessment (test): This assessment focuses on the applicant's aptitude, related work experience, career goals, personal presentation skills, and financial support. Those who secure 50% will qualify for the study.

Core Courses (18 Credit Hours = 12 TH + 6 PR)

SN	Courses	Credit Hours	Theory	Practical
1.	EDUC 100 The Teaching Profession	3	2	1
2.	ENGT 100 General English	3	2	1
3.	EDUC 200 Educational Psychology	3	2	1
4.	NEPL 200 General Nepali	3	2	1
5.	EDUC 300 Curriculum Development	3	2	1
6.	EDUC 301 Measurement and Evaluation	3	2	1
Total		18	12	6

EDUC = Education, COME = Communication English, COMN = Communication Nepali

The course outline of the Core Course of B Tech Ed for Semester One is overleaf and the descriptions of all Core Courses are in Annex - A

CORE Course Outline for Semester 1

Course**:** The Teaching Profession   Code: EDUC 100

Credit Hours: 3   Nature: Theory and Practical

Course Description

Teaching is a noble profession through which teachers facilitate students' learning to construct knowledge and develop skills to meet the goals of education. A teacher inspires and empowers students through the proper use of 'Hand, Heart and Mind'. For this, a teacher needs to develop professional knowledge and skills through experience and formal education. One of the essential features among teachers is that they should be acquainted with different philosophical orientations of teaching professions to develop their professions as per the demanding need of the local and global contexts and develop their better version. In this context, this course is designed to illustrate the various evolution of the teaching profession in different cultures and civilizations. In this, students will be acquainted with the professional standards of the teaching profession to be better teachers.

Similarly, students will develop a sound understanding of teaching as mentoring and coaching. Moreover, it is necessary to identify and explore different models (reflective practice) of the development of the teaching profession. So, this course will be beneficial for everyone who can see themselves being a professional teacher with knowledge and skills of various teaching professional features.

Learning Outcomes

- Develop a sound understanding of different philosophical orientations of teaching professions in the local and global contexts
- Exhibit skills of teaching as a process of continuous growth and development of teachers through reflective practice
- Demonstrate the roles of teacher as mentor and coach
- Appraise professional standards of the teaching profession

Unit/Module Outlines

Modules/Units	Descriptions
Philosophical Foundation and Evolution of Teaching Profession	- Historical root of teaching profession - Teacher in classical and modern times - Teacher as expert, facilitator and change agent Source: https://www.sciencedirect.com/science/article/pii/S1877042816000549

Professional Standards for Teachers	• Knowing students • Knowing contents and methods • Plan and implement teaching effectively • Developing and maintaining safe learning environment • Assessing students and providing feedback for better learning • Continuing professional learning • Working professionally with communities and beyond Source: https://www.aitsl.edu.au/docs/default-source/national-policy-framework/australian-professional-standards-for-teachers.pdf
Models of Teacher Professional Development	• The action research model • The reflective practice/cycle model • The lifelong learning model • The currere model Source: https://www.tandfonline.com/doi/abs/10.1080/09751122.2015.11890375
Teacher in the 21st Century	• Transmitter and facilitator • Cultural reproducer and change agent • Facilitator of values clarification • Teacher as learner and researcher Source: https://journals.sagepub.com/doi/full/10.1177/1745499919829214
References	Buchanan, J. (2020). *Challenging the Deprofessionalisation of Teaching and Teachers*. Springer Singapore. Monteiro, A. R. (2015). *The teaching profession: Present and future* (pp. 47-60). Dordrecht: Springer International Publishing.

(Vocational Pedagogical Courses (20 Credit Hours = 10 Th + 10 Pr)

Courses	Credit Hours	Theory	Practical
1. VPED 100 Principles and methods of technical instruction (2)	2	1	1
2. VPED 101 Instructional System Design (2)	2	1	1
3. VPED 210 Instructional Skills (I)	2	1	1
4. VPED 220 Instructional Skills (II)	2	1	1
5. VPED 300 Designing Occupational Curriculum (2)	2	1	1
6. VPED 301 TVET Ecosystem in Nepal (2)	2	1	1
7. VPED 302 Training Methodology (2)	2	1	1
8. VPED 303 Assessment in TEVT (2)	2	1	1
9. VPED 400 Materials Development in TVET (2)	2	1	1
10. VPED 401 Enterprise Development (2)	2	1	1
Total	20	10	10

VPED = Vocational Pedagogy

The course outline of the Vocational Pedagogical Course of B Tech Ed for Semester One is overleaf and the descriptions of all Vocational Pedagogical Courses are in Annex - B

VOCATIONAL PEDAGOGICAL Courses Outline for Semester 1

Course**:** Principles and methods of technical instruction (2) Code: VPED 100

Credit Hours: 2   Nature: Theory and Practical

Course Description

This course is designed to provide theoretical and practical exposure to students in planning teaching, learning, and evaluation by applying various methods based on the subject matter. It helps develop a sound understanding to get to know the learners in terms of their background, prior learning, sociocultural contexts, etc. Similarly, the course also centralizes its goal to help students locate and acquire the resources: dry and wet labs, studios, maker space, workshop, etc. Moreover, another primary focus is to help students be aware of impending difficulties, questions, disruptive behavior, conflicts, and ways of handling them by being mindful of different learning difficulties the learners face in skills development. Also, the course focuses on promoting independent learning among the learners through self-discovery, problem-solving, and product development.

Learning Outcomes
- Demonstrate a sound understanding of various technical instructions
- Apply various methods while planning for teaching and evaluation
- Explore multiple strategies to understand students based on their background, prior learning, sociocultural contexts
- Compare and contrast among various resources
- Explore ideas to handle the behaviors of students
- Develop skills in being mindful of different learning difficulties faced by learners and help them to progress
- Apply the principles of making students independent learners
- Develop lessons that use transversal skills for their vocational areas

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Module/Unit Outlines

Modules/Units	Descriptors
Introduction to Technical Instruction	• Methods and orientations, • Experiential learning of John Dewey • Developing competencies and outcomes • Developing tasks and activities Source: https://eacea.ec.europa.eu/national-policies/eurydice/content/teaching-and-learning-vocational-and-technical-upper-secondary-education_en

Understanding Students in Educational Instruction	• Developing students' profiles • Assessing prior knowledge • Planning for remedial instruction • Addressing diversities as asset Source: https://www.nap.edu/read/5287/chapter/9
Resource Materials for the Instructional Activities	• Projected and non-projected materials for technical instruction • Instructional media • Apps and Learning Management System Source: https://teaching.unl.edu/course-design/flex-hybrid/instructional-materials/
Classroom Management	• Management for efficiency and management for equity • Promoting participation • Ensuring the success for all -reaching out to all Source: https://web.calstatela.edu/faculty/jshindl/cm/Chapter11pedagogy-final.htm
Work and learning	• Situated Learning: Work as context for learning • Complexity of work and learning • Different forms of work-based learning • Developing work-based learning modules https://doi.org/10.1108/13665621311316447
Transversal Skills for technical and vocational education	• The 4 C framework—Communication, Critical Thinking, Creativity and Collaboration • The blend of soft and hard skills • Integrating transversal skills for TVET lessons Source https://bangkok.unesco.org/content/transversal-skills-tvet-pedagogies-and-assessment
References	Rus, R. C., Husain, M. A. M., Hanapi, Z., & Mamat, A. B. (2020). TVETagogy: Teaching and Facilitating Framework (PDPC) for Technical and Vocational Education and Training (TVET). *International Journal 0f Academic Research In Business And Social Sciences*, *10*(3). Pavlova, M., & Chen, C. S. (2019). Facilitating the development of students' generic green skills in TVET: an ESD pedagogical model. *TVET@ Asia*, *12*, 1-21.

	Maclean, R., & Wilson, D. (2009). *International handbook of education for the changing world of work: Bridging academic and vocational learning* (Vol. 1). C. A. Chinien (Ed.). Dordrecht: Springer Netherlands.

Information Technology (80 Credit Hours = 48 Th + 32PR)

SN	Name of the Module	Credit Hour		
		TH	PR	Total
1.	ITEX 100 Information System	2	1	3
2.	ITEX 101 Software Development	2	1	3
3.	ITEX 102 Computer Programming Using C	2	1	3
4.	ITEX 103 Object-Oriented Programming	2	1	3
5.	ITEX 104 Creativity & Innovation	1	1	2
6.	ITEX 105 Professional Issues in IS Practices	2	0	2
7.	ITEX 110 Mathematical Concepts for Computing	2	1	3
8.	ITEX 111 Computer & Network Technology	2	1	3
9.	ITEX 120 Probability & Statistical Modelling	2	1	3
10.	ITEX 121 Computer Networks	2	1	3
11.	ITEX 200 Python Programming	2	1	3
12.	ITEX 201 System Analysis & Design	2	1	3
13.	ITEX 210 Database Systems	2	1	3
14.	ITEX 211 Software Engineering	1	1	3
15.	ITEX 212 Microprocessor & Computer Architecture	2	1	3
16.	ITEX 213 Principles of Internet Technologies & Web Applications	2	1	3
17.	ITEX 214 IT Project Management	1	1	2
18.	ITEX 215 Cloud Computing	**1**	**1**	**2**
19.	ITEX 216 Research Methods for Computing and Technology	1	1	2
20.	ITEX 220 Advanced Database Management System	2	1	3
21.	ITEX 300 Management Information System	1	1	2
22.	ITEX 301 System Network Administration	1	1	2
23.	ITEX 320 Web Engineering	2	1	3
24.	ITEX 321 Advanced Software Engineering	1	1	3
25.	ITEX 322 Computer Maintenance & Troubleshooting	1	1	2
26.	ITEX 323 Internet of Things (IoT), Concepts & Applications	1	1	2
27.	ITEX 324 Artificial Intelligence	1	1	2
28.	ITEX 325 Entrepreneurship	2	1	2
29.	ITEX 326 IT & the Environment	1	1	2
30.	ITEX 340 Professional IT Project-I	1	1	2
31.	ITEX 499 Professioanl IT Project-II	1	2	3
	Total	48	32	80

ITEX = Information Technology Education Extension Course

Semester-wise Components of B Tech Ed (Information Technology)

Year	Semester	Educational Core and Research (21)	Vocational Pedagogy/Research and Internship (35)	IT	Total
1	I	EDUC 100	VPED 100	ITEX 100 ITEX 101 ITEX 102 ITEX 105 ITEX 110	19
	II	ENGT 100	VPED 101	ITEX 103 ITEX 104 ITEX 111 ITEX 120 ITEX 121	19
2	III	EDUC 200	VPED 210	ITEX 200 ITEX 201 ITEX 210 ITEX 211 ITEX 215	19
	IV	NEPL 200	VPED 220	ITEX 212 ITEX 213 ITEX 214 ITEX 216 ITEX 220	18
3	V	EDUC 300	VPED 300 VPED 301	ITEX 300 ITEX 320 ITEX 321 ITEX 301 ITEX 340	19
	VI	EDUC 301	VPED 302 VPED 303	ITEX 322 ITEX 323 ITEX 324 ITEX 325 ITEX 326	17
4	VII	EDUC 421	VPED 400 VPED 441	ITEX 499	14
	VIII		VPED 401 VPED 442 VPED 499		11
					136

The course outlines of the Information Technology components of B Tech Ed (Information

Technology) for Semester One are overleaf, and the descriptions of all courses are in Annex – E[2]

INFORMATION TECHNOLOGY Courses Outline for Semester 1

Course: Information System   Code: ITEX 100
Credit Hours: 3   Nature: Theory and Practical

Course Descriptions :
The course helps learners develop fundamental knowledge and understanding relating to data management, systems analysis, and design, explore information flow within organizations, and consider the impact of emerging trends in information technology.

Objectives/Learning Outcomes :

- o Understand the management and support of computer systems in an organisation
- o Show an understanding of the flow of information within organisations
- o Understand the differing types and processing of information
- o Propose practical solutions to given analytical problems
- o Demonstrate the effective use of a chosen methodology through requirements analysis and fact-finding techniques
- o Display an awareness of systems development tools and techniques
- o Become conversant with system design issues
- o Develop awareness of the basic ideas behind using a computer to store and manipulate data
- o Display knowledge of data analysis and modelling techniques
- o Discuss various database management architectures
- o Demonstrate an awareness of Human Computer Interaction and the use of multimedia and hypermedia
- o Suggest suitable testing strategies and implementation techniques
- o Understand the need for quality assurance/security in computer systems development and operation

Course Outlines

Unit/Module One- Data Management

- Understanding Nature of Information
    - o Acquisition, presentation, storage and management
    - o Characteristics of data
    - o Data capture and collection
    - o Data processing and data modelling
- Requirements analysis.
    - o Prototyping
    - o Fact finding methods
    - o Security, integrity and control
- Describe database design issues.
    - o Entity modelling, normalisation, logical/ physical mapping
    - o Database architectures and types of database management systems
    - o Functions of database management systems and database administration

- Understanding Multimedia and Hypermedia
    - HCI
    - Any form of media
    - Speech recognition

Unit/Module Two – Information System Analysis

- System Development Life Cycle
    - Implications for software design
    - Coding
    - Testing d. Implementation
    - Security and support
- Prototype and system development tools
    - Rapid application development and prototyping techniques
- Structured systems analysis and design.
    - Hard and soft system methodologies
    - Object-oriented modelling
- Analysing Human Computer Interaction Design
    - Making systems fit for purpose
    - Accessibility

Unit/Module Three : Introduction to Operating System and System Software

- Basic idea of management functions and structure of business and other organisations
- General theory - triangle of strategic information
- Considering new systems
    - Management of computer systems
    - Staffing
    - Maintenance
    - Project management and scheduling
- Quality assurance aspects.
    - Quality assurance methods
    - Stakeholders' involvement in quality assurance
    - Impact of using quality assurance methods

Unit/Module Four : Advances in Technology & Emerging Trends in IS

- Online technologies
- Software development
- Automation

References

- Introduction to Information Systems by P. Wallace
- Database Systems: A Practical Approach to Design, Implementation and Management by T. Connolly and C. Begg

INFORMATION TECHNOLOGY Courses Outline for Semester 1

Course: Software Development Code: ITEX 101
Credit Hours: 3 Nature: Theory and Practical

Course Descriptions

Learners will understand fundamental concepts of the programming process, consider issues related to the various phases of software development, and be introduced to different types of programming concepts. Learners will be able to develop and understand algorithms. Learners will be also able to develop code from algorithms in a high-level programming language.

Objectives/Learning Outcomes

o Distinguish between systems software and application software
o Understand the phases of software development
o Be able to develop and understand algorithms
o Be able to develop code from algorithms in a high-level programming language
o Be able to follow high level code and apply modifications to it
o Develop competence in the techniques of systematic problem analysis, program construction and documentation
o Gain an understanding of the basic concepts of good user-interface design
o Understand and develop test strategies
o Understand the need for quality assurance/security in software development and its operation
o Gain an understanding of the principles of multiple module program construction
o Understand the need for compilers, interpreters, code generators
o Develop a knowledge and understanding of a range of fundamental algorithms

Course Outlines

Unit/Module One- Fundamental concepts of the Programming Process

o Explain the nature of information
o Design algorithms and Developing code from an algorithm.
o Writing Pseudocode and Drawing flowcharts
o Utilization of Pseudocode & Flowcharts

Unit/Module Two : Phase Specific issues of Software Development

o Development techniques such as modular programming, defensive programming and recursion

- Approaches to software build, such as evolutionary prototyping or object oriented programming and functional programming.
- Objectives and principles of testing and test-case specification. Testing and debugging strategies including dry-running, white-box and black-box
- Styles of software documentation, such as for users or support personnel. Content of software documentation such as GUI descriptions and maintenance details
- Role of quality assurance and security
- Impact of the cloud and emerging technologies

Unit/Module Three : Introduction to Programming Concepts

- Types: numeric and non-numeric, elementary and derived, subtypes, and expressions such as assignments, input/output
- Subprograms: e.g. subroutines, procedures and functions
- Data structures: Arrays, Lists and Tuples, implementation of queues, stacks and collections.
- Concept of data abstraction
- Sorting and searching algorithms
- Comparative effectiveness with respect to computation and storage.

Unit/Module Four – Files

- Creating, storing, and/or retrieving the contents of a file located on a secondary storage device.

Unit/Module Five– Introduction to Concepts of User Interface Design

- User requirements and characteristics of user interfaces; principles and techniques of dialogue control, navigation and selection

Unit/Module Six –Role and Need for System Software

- System software and its relation to application software

Unit/Module Seven –Case Studies in Problem Solving & Algorithm Analysis

- Create and/or implement an algorithmic solution given a scenario or specification.

References

- Grokking Algorithms by A Bhargava.
- The Self-Taught Programmer by Althoff C.

INFORMATION TECHNOLOGY Courses Outline for Semester 1

Course**:** Introducing Computer Programming using C   Code: ITEX 102

Credit Hours: 3   Nature: Theory and Practical

Course Descriptions

This module introduces C programming concepts and software development using C

Programming Language.

Objectives/Learning Outcomes

- Design, implement, and document (appropriately) efficient algorithms for a C application using a structured approach to programming.
- Explain and apply the concept of a procedural programming paradigm and apply the associated design principles to a range of problem solutions.
- Illustrate the use of C as both an application and a systems programming language by being able to design, implement, and document efficient algorithms for a C application.
- Explain the structure, correct use of and implementation of appropriate advanced data structures for a range of scenarios.

Course Outlines

Unit/Module One : Algorithm Design with Pseudocode and Graphical Representation

- Algorithms
  - Expressing Algorithms
  - Benefits of Using Algorithms
  - General Approaches in Algorithm Design
  - Analysis of Algorithms
- 1.4 Flowcharts
  - Advantages of Using Flowcharts
  - Limitations of Using Flowcharts
  - When to Use Flowcharts
  - Flowchart Symbols & Guidelines
  - Types of Flowcharts
- Steps in Solving a Problem
- Activities involved in Program Design

Unit/Module Two : Introduction

- o Introduction to C Programming
  - Introduction to programming language
  - Application aspects
  - Lexical elements , data types and operators
  - Programming structure and construction.
    - o Standard library and function.
    - o Programming Style.
    - o Program structure.
  - Writing and Running a C program.

Unit/Module Three – Programming Construction

- Programming construction - Conditional Controls
  - o IF statement
  - o IF – Else Statement
  - o Nested IF – Else
  - o Switch case statements
- Programming construction - Iterative Controls
  - o While loop
  - o For loop
  - o Do-while loop
  - o Nested loops

Unit/Module Four : Arrays & Pointers

- Arrays
  - o Introduction to arrays
  - o One Dimensional
  - o Two Dimensional
- Pointers
  - o Introduction to pointers
  - o Declaring and accessing data through pointers.

Unit/Module Five: Modular Programming in C (Functions)

- Concepts of Functions
- Call by value and Call by reference
  - o Recursion concept
- Storage classes
  - o Auto
  - o Extern
  - o Register
  - o Static

Unit/Module Six: Data Structures

- Struct
- Union
- Bitfields
- Dynamic Memory Allocation
- Linked List

Unit/Module Seven: Record & Files

- Text and sequential files
- Creating and accessing files
- Validation, update and file maintenance algorithms

References

o Programming in ANSI C, 8/e by E Balagurusamy
o C: How to Program by Deitel, P and Deitel
o Data Structures Using C by Reema Thareja

INFORMATION TECHNOLOGY Courses Outline for Semester 1

Course: Professional issues in IS Practices   Code: ITEX 107

Credit Hours: 2   Nature: Theory and Practical

Course Descriptions

This module is intended to broaden Learners' thinking and encourage them to consider wider aspects of business and technical knowledge, skills, and experience. Its aim is to create well-rounded individuals who can make a strong contribution to the workplace and show sensitivity to business needs, as it is vital in the modern workplace for Learners to understand more than the software alone.

Objectives/Learning Outcomes

Upon completion of this module, candidates will be able to:

o Describe the process of four management functions in organisation.
o Explain the underlying theories and conceptual frameworks related to managerial and organisational issues through a presentation.
o To understand the basic financial accounting related terms.
o Understand the IT policy of Nepal and laws related to internet.

Course Outlines

Unit/Module One- Introduction to Management and Management History

o Theories in classical approach
o Theories in behavioral approach.
o Theories in quantitative approach
o Theories in contemporary approach.

Unit/Module Two - Managers in the Workplace

o Who is a managers and where do they work?
o Organizational Structure & Levels of the Management
o Why are managers are important to the organization.
o Efficiency and effectiveness in the management
o Describe the functions, role and skills of the managers.
o Mintzberg's Managerial roles

- o Katz's Managerial roles
- o Making Decisions
- o Managing External Environment
- o Planning and Managing Strategy
- o Motivation
- o Leadership

Unit/Module Three - Introduction to Financial Accounting

- o Meaning and Scope of Accounting
- o Accounting Principles
- o Accounting transactions
- o Capital and Revenue
- o Balance sheets, profit and loss accounts, and cash flow statements
- o Budgeting

Unit/Module Four- Introduction to IT policy of the Nepal and Laws related to IT

- o IT policy of the Nepal
- o Cyber law of Nepal

References

- o Management (14th Ed) by Robbins, S.P. and Coulter, M
- o Financial Accounting & analysis by Taraprasad Upadhaya
- o Financial Accounting Book for B.Com-Hons- by CA Dr.P C Tulsian & CA Bharat-Tulsian
- o Nepal's Rules and Regulation by Nepal Kitabkhana

INFORMATION TECHNOLOGY Courses Outline for Semester 1

Course**:** Mathematical Concepts for Computing   Code: ITEX 113

Credit Hours: 3   Nature: Theory and Practical

Course Descriptions

This module will introduce the basic computing mathematical concepts required. The computing module elaborates the relationship and interdependence of mathematics & computing. The topics that include in this module are number base system, set theory, relations & functions, logic and Boolean algebra, graph theory, discrete probability, and proof techniques.

Objectives/Learning Outcomes :

- Show how data are represented and stored in the computer
- Read, comprehend, and construct mathematical arguments with mathematical reasoning.
- Solve problems that include sets, permutations, relations, graphs, and trees used to represent discrete objects & relationships between these objects.
- Apply counting principles to calculate the probability problems.
- Calculate summary measures of statistics and make inferences about characteristics of populations from information contained in samples.

Course Outlines

Unit/Module One: Number Base System

- Introduction
- Conversion of numbers between different base systems (base 2, 8, 10, 16)
- Computer arithmetic
- Number representation & storage

Unit/Module Two:Set Theory

- set notations
- set operations
- law of sets
- Venn diagrams
- Problem-solving using formulae

Unit/Module Three: Relations & Function

- Relation on a set
- properties of relations
- function, notation & terminology describing function
- operations on functions

Unit/Module Four: Discrete Probability

- The basic of counting
- Permutations & Combinations
- Discrete probability
- Probability theory

Unit/ Modules Five: Statistics

- Introduction to Statistics
  - Measures of position - mean, median and mode
  - Measure of dispersion – variance and standard deviation.
  Sampling Distribution and Hypothesis Testing (Introduction)

- Normal distribution
- Define sampling & sampling distribution
- Central limit theorem
- Standard error
- Estimation of confidence intervals
- Estimation of means
- Fundamental of hypothesis testing
- Type I and Type II error

Unit/ Modules Six: Logic and Boolean Algebra

- Basic concepts
- Logical operators
- Truth tables
- Boolean functions
- Representing Boolean functions
- Law of Boolean Algebra
- Karnaugh maps

Unit/ Modules Seven: Graph Theory

- Introduction to graphs
- Graph terminology
- Representing graphs
- Introduction to trees
- Paths and circuits
- Application of trees
- Tree traversal

References

- o Fundamentals of Discrete Math for Computer Science- A Problem-Solving Primer By Tom Jenkyns, Ben Stephenson ·
- o Discrete Mathematics 8th Edition by Richard Johnsonbaugh
- o Fundamentals of Mathematical Statistics By S.C. Gupta, V.K. Kapoor

Internship and Research (18 Credit Hours = 1 Th + 17 Pr)

SN	Courses	Theory	Practical	Total
1	EDUC 421 Educational Research	1	2	3
2	VPED 441 Internship – Teaching/Training	0	6	6
3	VPED 442 Internship – Work-based learning	0	6	6
4	VPED 499 Educational Research Project	0	3	3
	Total	1	17	18

Evaluation Scheme

The evaluation scheme shall follow a continuous assessment system with an ethos of competency-based assessment. Specifically, the practical components shall be assessed in the lab, at the workplace, and/or via a learning portfolio. The theoretical components shall be evaluated via written, oral, demonstration and/or all means. Kathmandu University Grading System will apply.

Graduation Requirements

Individuals completing all of the requirements shown on their approved Planned Program of Study are eligible for graduation. However, the required minimum cumulative grade point average

(CGPA) of courses is 2.00 and also in the examination administered by Kathmandu University (See details in "Grading and Certification System").